A Flora of California

BY

WILLIS LINN JEPSON
Professor of Botany, University of California

ILLUSTRATED WITH MANY ORIGINAL FIGURES

PART VI

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A FLORA OF CALIFORNIA

by

WILLIS LINN JEPSON

Professor of Botany in the University of California

Consisting of an original descriptive account of the flowering plants of California, with critical notes on the species and illustrated with many original figures.

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ABBREVIATIONS

co.—county; *cos.*—counties.
acc.—according to.
type loc.—the station or locality where type specimen was collected.
type spm.—type specimen.
isl.—island.
comm.—communicated by.
det.—determined by.
locs.—stations listed under this paragraph heading are always Californian and within the geographic range for California, as indicated, unless definite statement is made to the contrary. Only selected specimens are cited—those which best represent the species and most effectively validate the range.

NEW YORK
BOTANICAL

Southern California. Mexico, tropical America.

Locs.—San Bernardino Mts., acc. Parish; Rock Creek, acc. Parish; Elsinore Lake, acc. Parish.

Refs.—CYPERUS SPHACELATUS Rottb. Desc. & Ic. 23 (1773). *C. parishii* Britton; Parish, Bull. S. Cal. Acad. 3:52, pl. 3 (1904), type from San Bernardino, *Parish* 3816.

9. **C. esculentus** L. CHUFA. NUT-GRASS. Perennial, with slender rootstocks bearing small globose tubers; stems triangular, ½ to 1 foot high; spikes in an umbel subtended by foliaceous bracts 7 inches long or less; spikelets chestnut-brown, linear, 4 to 8 inches long, the joints of the rachis with a narrow wing on each side subtending the achene; scales ovate, obtuse, 3 or 4 nerves each side of the keel, 1½ lines long; achene black, 3-angled.

Infrequent but widely scattered in California. East to the Atlantic. All continents.

Locs.—Los Angeles, *Braunton* 630, 671, 723; Colton, *Parish* 2227; Yosemite, *Jepson* 8366 (spikelets subcapitate); Ione, *Braunton* 1175; Cloverdale, *Brush.* Var. **heermannii** Britton; spikes clustered at summit of rays and involucellate; spikelets sometimes bracteate.—Southern Sierra Nevada (Bot. Cal. 2:215).

Refs.—CYPERUS ESCULENTUS L. Sp. Pl. 45 (1753), type loc. Montpellier, France; Clarke, Jour. Linn. Soc. 21:178 (1884); McAtee, U. S. D. A. Bull. 58:8, figs. 8–10 (1914). Var. HEERMANNII Britton, Bull. Torr. Club, 13:211 (1886). *C. phymatodes* Muhl. Gram. 23 (1817); Wats. Bot. Cal. 2:215 (1880). Var. *heermannii* Wats. l.c. *C. heermannii* Buckley, Proc. Phila. Acad. 1862:10 (1863), type from Kern River, *Heermann.*

10. **C. strigosus** L. Perennial; stems 1 to 1½ feet high; spikes dense, ½ to 1 inch long, on rays 5 inches long or less, in a more or less compound umbel, the foliaceous involucral bracts 2 to 10 inches long; spikes with the lowest scales persistent on rachis after fall of spikelet from spike; spikelets linear, 6 to 9-flowered, 4 to 9 lines long, the slender joints with a scarious wing embracing one margin of the achene; scales slender ovate, 2 (or 3) callous striae on each side the keel, 2 lines long; achene oblong, 3-angled.

Sierra Nevada. Texas to Florida and Maine.

Loc.—Mormon Bar, Mariposa Co., *Congdon.*

Refs.—CYPERUS STRIGOSUS L. Sp. Pl. 47 (1753), Jamaica, Virginia. *C. stenolepis* Wats. Bot. Cal. 2:215 (1880), not Torr.

11. **C. speciosus** Vahl. Annual; stem stout, 1 foot high; umbel compound or simple, subtended by several foliaceous bracts 5 to 13 inches long; rays 1 to 2 inches long; spikelets linear-lanceolate, 3 to 6 lines long, spreading at mostly right angles to the spike, the very short joints of its rachis winged with very broad scarious margins which enclose the 3-angled achene; scales ovate, overlapping, with a round green back and scarious rusty red sides, 1½ lines long.

Upper San Joaquin Valley; Southern California. East to the Atlantic. Tropical regions.

Locs.—Visalia, *Congdon;* San Bernardino, *Parish* 3819, 6432; Los Angeles River, *Braunton* 578.

Refs.—CYPERUS SPECIOSUS Vahl, Enum. 2:364 (1806), type loc. Va.; Parish, Bull. S. Cal. Acad. 3:54 (1904). *C. michauxianus* Schult. Mant. 2:123 (1824); Wats. Bot. Cal. 2:215 (1880).

12. **C. ferax** Rich. Annual, closely related to C. speciosus, but leaves shorter, broader and with smoother margins; scales more rigid; spikelets stouter.

Common in Southern California. East to Missouri; widely distributed in Tropical America.

Locs.—San Bernardino, acc. *Parish;* Elsinore, acc. *Parish.*

Refs.—CYPERUS FERAX Rich. Act. Soc. Hist. Nat. Paris 1:106 (1792). *C. longispicatus* Norton, Trans. Acad. St. Louis 12:37, pl. 5 (1902), type loc. San Antonio, Tex., *B. F. Bush* 1248; Parish, Bull. S. Cal. Acad. 3:54 (1904).

2. **ELEOCHARIS** R. Br. Spike-Rush.

Annuals or chiefly perennials. Stems tufted, simple, terminating in a solitary spikelet not subtended by an involucre. Leaves reduced to sheaths or the lowest rarely blade-bearing. Spikelets several to many-flowered. Scales concave. Stamens 2 or 3. Perianth-bristles 3 to 9, commonly retrorsely barbed. Style 3-cleft and achene 3-angled, or 2-cleft and achene lenticular; base of the style enlarged and persistent as a tubercle on the summit of the achene.—Species 127, widely distributed from the arctic to antarctic regions. (Greek elos, marsh, and charis, delight.)

Bibliog.—Fernald, M. L., Eleocharis ovata and its N. Am. Allies (Proc. Am. Acad. 34:485–497,—1899).

Style mostly 2-cleft; achene lenticular or biconvex.
- Achene jet-black; tubercle depressed; annual ..... 1. *E. capitata.*
- Achene light-brown.
  - Perennial; tubercle conical, less than half as broad as the body of the achene; spikelet lanceolate ..... 2. *E. palustris.*
  - Annual; tubercle thin, deltoid, as broad or nearly as broad as the achene; spikelet ovate.
    - Bristles often nearly twice as long as the achene ..... 3. *E. obtusa.*
    - Bristles ¼ to ½ as long as the achene ..... 4. *E. monticola.*

Style 3-cleft; achene turgid or 3-angled; perennial.
- Tubercle reduced to a mere scar or very obscure ..... 5. *E. bolanderi.*
- Tubercle well-developed and more or less prominent.
  - Achene with several longitudinal ridges connected by a transverse lattice-work; spikelet flattened ..... 6. *E. acicularis.*
  - Achene smooth.
    - Stems erect or nearly so, not rooting at tip; tubercle constricted at base or at least sharply defined from the achene.
      - Spikelet lanceolate; scales acute ..... 7. *E. parishii.*
      - Spikelet oblong; scales obtuse ..... 8. *E. montana.*
    - Stems or some of them bending over and rooting at tip; tubercle subulate or narrowly pyramidal, continuous with the achene ..... 9. *E. rostellata.*

1. **E. capitata** R. Br. Stems erect, tufted, 7 to 8 inches high; spikelet ovate, 1¼ to 2 lines long; bristles 6 (or 7), about as long as the achene; stamens 2 or 3; achene black and shining, lenticular; tubercle white, thin and a little like a skull-cap.

Wet sandy soil, Southern California. Eastern United States, Asia, Africa, Australia.

Locs.—Warm Creek, San Bernardino, *Parish;* Palm Sprs., acc. *Parish;* Thousand Palms Cañon, Riverside Co., *Jepson* 6043; Dos Palmas, *Hall* 5984.

Ref.—Eleocharis capitata R. Br. Prodr. Fl. Nov. Holl. 1:225 (1810), types from Virginia and the Caribbees.

E. atropurpurea Kunth, Enum. Pl. 2:151 (1837). *Scirpus atropurpureus* Retz. Obs. 5:14 (1789), type loc. India. Near E. capitata; scales minute; bristles 2 to 4, white, or wanting; achene jet-black, lenticular; tubercle conic, minute, depressed.—Visalia (acc. Coville, Contrib. U. S. Nat. Herb. 4:211). Widely distributed, occuring in the eastern United States and in all continents.

2. **E. palustris** R. & S. Common Spike-rush. Wire-grass. (Fig. 14.) Stems ½ to 2 feet high, stoutish, mostly terete, sheathed at the base, leafless, creeping, stoloniferous; sheaths sub-truncate; rootstock stout; spikelet many-flowered, 6 to 14 lines long; bracts ovate-oblong to oblong-lanceolate; scales ovate-oblong, purplish brown with scarious margin; bristles 3, rather shorter than the achene; style 2-cleft; achene obovoid, biconvex; tubercle deltoid, constricted at the point of junction.

Ponds, marshes and shallow slow-moving creeks, at low altitudes in California. North to British Columbia and east to the Atlantic. Europe, Asia.

Locs.—Sierra Valley, *Jepson* 8044; Honey Lake Valley, *Davy* 3288; Jess Valley, Modoc Co., *Jepson* 7988; Klamath Hot Sprs., *Goldsmith* 26; Yreka, *Butler* 1410; Sisson, *Jepson* 58a; Eureka, *Tracy* 2973; Chico, *Copeland* 3182; Los Guilicos Valley, *Bioletti;* San Francisco, *Davy* 4012; Lake San Andreas, San Mateo Co., *Davy* 764; Irvington, *Jepson;* Ione, *Braunton* 1058; Oakdale, *Jepson* 8337; Victor, *Parish* 10562; Palo Verde Valley, *Hall* 5919; San Bernardino, *Parish;* Elsinore, *McClatchie* 23.

Refs.—Eleocharis palustris R. & S. Syst. Veg. 2:151 (1817); Davy in Jepson, Fl. W. Mid. Cal. 85 (1901). *Scirpus palustris* L. Sp. Pl. 47 (1753), type European. Var. glaucescens Gray, Man. 558 (1848), type North American; tubercle narrower, sometimes half as long as the achene.—Southern California (San Jacinto Mts. and San Bernardino Valley), acc. Parish, Bull. S. Cal. Acad. 3:68 (1904).

Fig. 14. Eleocharis palustris R. & S. *a*, spikelet, × 1; *b*, achene, × 8.

3. **E. obtusa** Schult. (Fig. 15.) Stems tufted, numerous, erect, nearly terete, striate, 7 to 10 (16) inches high; annual with fibrous roots; spikes oblong-ovate to broadly ovate, 2 to 4 lines long; scales ovate to sub-orbicular, rounded at apex; bristles 6 to 9, mostly longer, sometimes nearly twice longer than the achene; achene smooth, shining, obovoid with a narrow base, somewhat flattened or biconvex with cord-like or thickened margins, the broad summit bearing a very thin deltoid acutish tubercle, in outline something like a cocked hat.

Moist places or in shallow water, Sierra Nevada and North Coast Ranges. North to Oregon. Atlantic States.

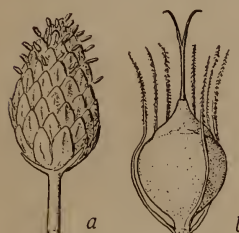

Fig. 15. Eleocharis obtusa Schult. *a*, spikelet, × 4; *b*, achene and bristles, × 13.

Locs.—Scott Valley, Lake Co., *Tracy* 2379; near Willow Creek, Trinity River, *Tracy* 3401; Oro Fino, Siskiyou Co., *Butler* 7, 1855; Yosemite Valley, *Jepson* 8369.

Refs.—Eleocharis obtusa Schult. Mant. 2:89 (1824). *Scirpus obtusus* Willd. Enum. Hort. Berol. 76 (1809), type North American.

4. **E. monticola** Fern. Resembling E. obtusa; stems 4 to 10 inches high; spikes ovate-lanceolate, 3 to 4½ lines long; scales acutish, more spreading.

Northern Sierra Nevada, and north to Oregon and Idaho.

Ref.—Eleocharis monticola Fern. Proc. Am. Acad. 15:496 (1899), based on spms. from the northern Sierra Nevada (*Lemmon* 485; *Mary E. P. Ames*, Plumas Co.), and Ore. (Multnomah Co., *Howell* 408).

5. **E. bolanderi** Gray. Stems tufted, 8 to 9 inches high, arising from rootstocks; spikes dark-colored, narrow-ovate, 2½ to 3 lines long; bristles 3 or 4, about ¼ to ½ (or ⅗) as long as the achene; achene obovoid, triangular with cord-like ridges at the angles; tubercle reduced to a flatish scar, very short and broad or somewhat obscure.

Central Sierra Nevada, 6000 to 7000 feet.

Locs.—Mariposa Grove, *Bolander* 4869; Hogan Mt., Mariposa Co., *Congdon;* Pea Ridge road, Mariposa Co., *Congdon.*

Ref.—Eleocharis bolanderi Gray, Proc. Am. Acad. 7:392 (1868), type loc. Wawona (Clark's), *Bolander.*

6. **E. acicularis** R. & S. Slender Spike-rush. (Fig. 16.) Stems tufted, ½ to 1½ (or 8) inches high, filiform or setaceous; rootstock very slender, creeping; spikelets a little flattened, 1 to 3 lines long, few-flowered; achene obovoid-oblong, ½ line long, obscurely triangular, with 9 or 10 longitudinal ribs connected by fine transverse lines; tubercle broad, short and blunt.

Moist places throughout California, but not reported from the deserts. All continents.

Locs.—Cuyamaca, *T. Brandegee;* Mt. San Jacinto, *Hall* 2232; San Bernardino, *Parish* 2143; Yosemite, *Jepson* 8365, 8371; Confidence, Tuolumne Co., *Jepson* 7707; Calaveras Grove, *Hillebrand* 2332; upper Fall River Valley, *Jepson* 5753; Klamath Hot Sprs., *Goldsmith* 22; Forestdale, Modoc Co., *Baker & Nutting;* Oro Fino, Siskiyou Co., *Butler* 866.

Fig. 16. ELEOCHARIS ACICULARIS R. & S. *a*, entire plant, × 1; *b*, spikelet, × 5; *c*, bract, × 18; *d*, achene, × 18.

Refs.—ELEOCHARIS ACICULARIS R. & S. Syst. Veg. 2:154 (1817). *Scirpus acicularis* L. Sp. Pl. 48 (1753), type European. *E. acicularis* var. *radicans* Britton, Jour. N. Y. Mic. Soc. 5:105 (1889).

7. **E. parishii** Britton. Stems 4 to 7 inches high, strongly striated, arising from a slender rootstock; spikes slender-lanceolate, 3 to 7 lines long, dark chestnut-color; bristles 6 (or 7), ciliate, exceeding or sometimes rather shorter than the achene; achene nearly plane on one side, convex and somewhat keeled on the other; tubercle narrow, short, somewhat like a fool's cap.

Valley and mountain marshes throughout California.

Locs.—Palm Cañon, e. base Mt. San Jacinto, *Parish* 6145; Sau Antonio Mts., *Hall* 1517; Mohave, *Parish* 9796; Seymour Mdws., Mt. Pinos, *Hall* 6025; San Emigdio, Potreros, *Hall* 6370; Owens Lake, *Hall & Chandler* 7325; Ibex Spr., Inyo Co., *Parish* 10025; San Joaquin River Bridge, *K. Brandegee;* Chico, *Copeland* 3280; Castle Rock, Sacramento River, *Goldsmith;* Hornbrook, Siskiyou Co., *Copeland* 3556.

Refs.—ELEOCHARIS PARISHII Britton, Jour. N. Y. Mic. Soc. 5:110 (1889), type loc. Palm Sprs. (Agua Caliente), *Parish* 1569. *E. disciformis* Parish, Bull. S. Cal. Acad. 3:81 (1904), type loc. e. base Mt. San Jacinto, *Hall* 2013 (in isotype material of this the achene shape, the tubercle and bristles are as in E. parishii; it is, however, said to be annual).

8. **E. montana** R. & S. Stems 10 to 14 inches high from stoutish rootstocks; spikelets narrowly oblong, 2½ to 5 lines long; scales straw-color or light-brown; bristles 5 or 6, exceeding or a little shorter than the achene; achene obovoid, flattish on one side, strongly convex on the other; tubercle conical, broadened at base.

Southern California, north in the Coast Ranges and Sierra Nevada. East to Colorado and New Mexico, south to South America.

Locs.—La Mesa, *Jepson* 6684; Witch Creek, San Diego Co., acc. *Parish;* Los Angeles, acc. *Parish;* San Bernardino Valley, *Jepson* 5595; Vietorville, *Parish* 10563; Soulsbyville, Tuolumne Co., *Jepson* 7686; Hopland, *Jepson* 7625.

Refs.—ELEOCHARIS MONTANA R. & S. Syst. Veg. 2:153 (1817), type loc. Quindiu, Columbia. *E. arenicola* Torr. Jour. Bost. Soc. Nat. Hist. 5:237 (1845), type loc. Galveston Isl., Tex., *Lindheimer.*

9. **E. rostellata** Torr. WALKING-SEDGE. Stems from a short caudex, 1 to 2½ feet high, the sterile ones bending over and rooting at the apex; spikelet oblong, 3 to 5-flowered; scales light-brown or straw-color; bristles 6, exceeding the achene; achene obovoid, obtusely triangular; tubercle stoutly subulate or narrowly pyramidal, half or nearly half as long as the achene.

Marshy meadows: eismontane Southern California and east and northeast through the Colorado and Mojave deserts. Mostly throughout North America.

Locs.—San Bernardino, acc. Parish; Owens Lake, *Jepson* 5117; Death Valley (Contrib. U. S. Nat. Herb. 4:211). Var. **congdonii** Jepson n. var. Bristles equaling the achene; tubercle barely ⅓ as long as the achene.—(Setae achenio aequales; tuberculum vix longum triente quam achenium).—San Francisco, *Congdon* (type).

Refs.—ELEOCHARIS ROSTELLATA Torr. Fl. N. Y. 2:347 (1843), based on material from New York and South Carolina. Var. *occidentalis* Wats. Bot. Cal. 2:222 (1880), based on spms. from Ft. Tejon, *Horn,* and San Bernardino Co., *Parry & Lemmon* 398.

3. **FIMBRISTYLIS** Vahl.

Annuals or perennials. Stems leafy below. Spikelets umbellate or capitate, terete, subtended by a 1 to many-leaved involucre. Scales spirally imbricated all around, mostly deciduous. Perianth bristles none. Stamens 1 to 3. Style 2 to 3-cleft, its base swollen, and commonly tuberculate, the whole falling away from the achene at maturity. Achene lenticular or 3-angled.—Species 131, all continents. (Latin fimbri, fringe, and stylus, style.)

Achene triangular; tubercle more or less persistent; style glabrous; annual ....1. *F. capillaris.*
Achene flattened or biconvex; tubercle deciduous.
Spikelets clustered; style glabrous, at least below; annual .....2. *F. vahlii.*
Spikelets umbellate, solitary on the rays or in the forks; style ciliate; perennial.
3. *F. thermalis.*

1. **F. capillaris** Gray. Stems tufted, somewhat bristle-like, 2 to 7 inches high, much exceeding the filiform leaves, and bearing 1 to 3 spikelets, when 3 the stem shortly forked at apex and bearing 1 spikelet in the fork; spikelets narrowly ovate, 1½ to 2½ lines long; involucral bract lanceolate-setaceous; "stamens 2"; achene obovoid, triangular, lightly wrinkled transversely, the angles somewhat thickened; tubercle small, deltoid, more or less persistent.

Sierra Nevada.

Loc.—Near the Royal Arches, Yosemite Valley, *Jepson* 8410.

Refs.—FIMBRISTYLIS CAPILLARIS Gray, Man. 530 (1848). *Scirpus capillaris* L. Sp. Pl. 49 (1753), cited as occurring in Virginia, Ethiopia & Ceylon. *Stenophyllus capillaris* Britton, Bull. Torr. Club, 21:30 (1894).

F. MILIACEA Vahl, Enum. Pl. 2:287 (1806); umbel diffusely compound; spikelets subglobose, about 1 line long; achene whitish, acutely triangular, muricate-tuberculate.—"Near San Francisco" (Bot. Cal. 2:223) in 1866, but not since found.

2. **F. vahlii** Link. Stems slender, densely tufted, 1 to 4 inches high, longer than or equaling the filiform leaves; spikelets in clusters, subtended by filiform elongated upright bracts which exceed the cluster 4 to 6 times; achene minute, transversely reticulate.

Very local in California: North Coast Ranges; upper San Joaquin Valley; lower Colorado River. Southeastern United States and South America.

Locs.—Clear Lake (Bot. Cal. 2:224); Visalia (acc. Coville, Contrib. U. S. Nat. Herb. 4:212); Ft. Yuma, *Parish* 8375, 8495.

Refs.—FIMBRISTYLIS VAHLII Link, Hort. Berol. 1:287 (1827). *Scirpus vahlii* Lam. Tab. Encycl. 1:139 (1791), type loc. Spain. *F. apus* appears to be merely a form in which the tubercle is reduced or obsolete and so we quote: *F. apus* Wats. Bot. Cal. 2:224 (1880); *Scirpus apus* Gray, Proc. Am. Acad. 10:78 (1874), type loc. shore of Clear Lake, *Bolander.*

3. **F. thermalis** Wats. (Fig. 17.) Stems 1 to 2 feet high, bearing few to many spikelets in a simple or compound umbellate cluster; leaves ½ to ⅔ as tall as the stems; spikelets oblong-ovate, 4 to 5 (or 7) lines long; style hairy; achene whitish, broadly obovoid, flattened, the tubercle linear, nearly as long, soon deciduous.

Margins of hot springs: Southern California northward to Inyo Co. Nevada.

Fig. 17. FIMBRISTYLIS THERMALIS Wats. *a*, cluster of spikelets, × 1; *b*, scale, × 5; *c*, achene, × 5.

Locs.—Owens Valley, *Brewer* 2832; Arrowhead Sprs., *Parish* 5528.

Ref.—FIMBRISTYLIS THERMALIS Wats. Bot. King 360 (1871), type loc. Hot Sprs., Ruby Valley, Nev., *Watson* 1216.

4. **SCIRPUS** L. Club-Rush. Bulrush.

Perennials or annuals. Stems leafy or the leaves reduced to mere sheaths at base. Spikelets terete or somewhat flattened, solitary or in heads, spikes or umbels, subtended by an involucre of 1 to several leaves or the involucre wanting. Perianth bristles 1 to 6, barbed or smooth, or none. Stamens 2 or 3. Style 2 or 3-cleft, not swollen at the base, deciduous or its base persistent on the achene. Achene triangular, lenticular or plano-convex.—Species 137, widely distributed in all lands. (Latin scirpus, bulrush.)

Bibliog.—Fernald, M. L., Representatives of Scirpus maritimus in America (Rhod. 2:239,—1900). Chase, A., N. Am. allies of Scirpus lacustris (Rhod. 6:65-71,—1904, with two excellent plates, 52 and 53).

Spikelets solitary and terminal; stems low, slender.—Subgenus Isolepis.
- Annual; involucral bract present.
  - Scales obtuse or merely acute ..... 1. *S. cernuus.*
  - Scales acute, shortly beaked, strongly keeled ..... 2. *S. carinatus.*
- Perennial; involucral bract none ..... 3. *S. pauciflorus.*

Spikelets in clusters; perennial.—Subgenus Eusciрpus.
- Stems low; achene longitudinally ribbed and horizontally striate ..... 4. *S. setaceus.*
- Stems tall; achene not longitudinally ribbed.
  - Bristles retrorsely barbed or ciliate, rarely wanting.
    - Stems terete or nearly so; spikelets congested or umbellate.
      - Stems leafy at base; spikelets in a sessile cluster ..... 5. *S. nevadensis.*
      - Stems leafless; spikelets in an umbellate or congested cluster.
        - Achenes (1 or) 1¼ to 1½ lines long, mostly ¼ to ⅓ longer than the scales.
          - Umbels capitate or of a few short rays; bristles barbed ..... 6. *S. acutus.*
          - Umbels long-rayed; bristles plumose ..... 7. *S. californicus.*
        - Achenes 1 line long, nearly equaling the scales ..... 8. *S. validus.*
    - Stems 3-angled.
      - Stems with a single head or compact umbel.
        - Involucral bract solitary; spikelets densely capitate-clustered, the inflorescence apparently lateral.
          - Stems very slender, leafy below; scales awn-tipped ..... 9. *S. americanus.*
          - Stems stout, leafless or mostly so; scales truncate or obtuse, quite awnless or with a minute point ..... 10. *S. olneyi.*
        - Involucral leaves several, foliaceous; inflorescence terminal, the spikelets capitate, or in an umbel with unequal mostly short rays; leaves mainly basal.
          - Awn of scale glabrous, smooth; achene plano-convex ..... 11. *S. campestris.*
          - Awn of scale minutely scabrid; achene as if trigonous, in reality flat on one face, carinate-convex on the other ..... 12. *S. fluviatilis.*
      - Stems bearing a panicle of irregular umbels, leafy to the top.
        - Pedicels or raylets erect or spreading, bearing few to several sessile spikelets.
          - Achenes rounded on the back; bristles 4 ..... 13. *S. microcarpus.*
          - Achenes angled on the back; bristles 6 ..... 14. *S. congdonii.*
        - Pedicels drooping, bearing a single spikelet ..... 15. *S. lineatus.*
    - Bristles with the barbs pointed upward; mature heads conspicuously hairy on account of the elongated bristles ..... 16. *S. criniger.*

1. **S. cernuus** Vahl. Slender Club-Rush. Stems tufted, filiform or setaceous, 2 to 9 inches high, sheathed at base, the uppermost sheath often bearing a short slender blade; involucral bract 1 to 3 lines long or almost none; spikelet solitary, oblong-ovate, 1 to 1½ or 2 lines long; scales round-ovate, concave, obtuse or merely acute, lineate-carinate; style 3-cleft; achene brown, ⅓ line long, obovoid, flattish on one side, convex-rounded and with a fine median ridge on the other, finely or somewhat obscurely papillate, apiculate.

Springy or marshy places near the coast, from San Bernardino Valley to Humboldt Co. and north to Oregon. All continents.

Locs.—Elsinore, *McClatchie* 24: San Bernardino, *Parish;* Neponset, Salinas River, *Abrams* 4025; Carmel, *Ferguson* 297; Montara Pt., *Copeland* 3315; Oakland, *Bolander;* Lake Merced, San Francisco, *Greene;* Tiburon, *Harriet Walker;* Olema, *Davy* 4356; Eureka, *Tracy* 816.

Refs.—SCIRPUS CERNUUS Vahl, Enum. Pl. 2:245 (1806), type loc. western part of the Spanish peninsula. *S. riparius* Spreng. Syst. 1:208 (1825). *Isolepis riparia* R. Br. Prodr. Fl. N. Holl. 1:222 (1810), type loc. Port Jackson, Australia.

2. **S. carinatus** Gray. DWARF CLUB-RUSH. Stems tufted, slender, triangular, 1 to 2 inches high, shortly leaved at base; involucral bract 4 to 9 lines long; spikelet solitary, ovate, 1½ to 2 or 3 lines long; scales strongly keeled, acute, 2 to 3-nerved on the sides, the midrib excurrent as a short beak; achene strongly triangular, globose in outline, light-brown, ¾ line long, obscurely short-necked at base.

Swamps and low spots near the coast from Mendocino Co. to San Diego Co.

Locs.—Mendocino City, *Bolander* 4757; San Francisco, *Bolander;* Del Monte, *Heller* 6771.

Refs.—SCIRPUS CARINATUS Gray, Proc. Am. Acad. 7:392 (1867). *Isolepis carinata* H. & A.; Torr. Ann. Lyc. N. Y. 3:349 (1836), based on spms. from New Orleans, *Drummond,* and the Arkansas River, *Nuttall.*

S. NANUS Spreng. Pug. 1:4 (1813), type loc. Mansfeld, Germany. *Eleocharis pygmaea* Torr. Ann. Lyc. N. Y. 3:313 (1836). Stems capillary, flattened and grooved, 1 to 1½ inches high; roots with minute tubers; involucral bract present; spikelet 2 to 4 (or 8) -flowered, greenish; scales ovate; bristles longer than the achene, often wanting; achene obovate, triangular, smooth and shining.—Brackish shores or salt marshes, widely distributed throughout North America, Europe, north Africa. Occurs in Oregon and Washington (Piper and Beattie, Fl. Nw. Coast, 84). California material has been referred here (Cucamonga, acc. Pac. R. Rep. 4:152; Honey Lake Valley, *Davy* 3290), but the specimens are too young for certain determination.

3. **S. pauciflorus** Lightf. (Fig. 18.) Stems striate, 3-angled, leafless, slightly tufted, very slender (2½ to 4½ inches high), from slender rootstocks; spikelet solitary, terminal, 2 to 3 lines long, without involucral bracts, few (about 3)-flowered; scales narrow-ovate, obtusish; bristles 2 to 6, as long as the achene or longer; stamens 3; style 3-cleft; achene obovoid-oblong, rather strongly beaked.

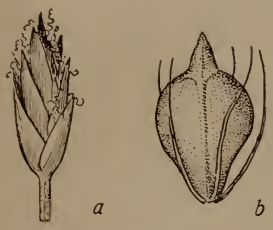

Fig. 18. SCIRPUS PAUCIFLORUS Lightf. *a*, spikelet, × 5; *b*, achene, × 16.

San Jacinto Mts. to the Sierra Nevada. Oregon to British Columbia, east to Maine. Europe, Asia.

Locs.—Round Valley, Mt. San Jacinto, *C. M. Wilder* 928; upper Santa Ana Cañon, San Bernardino Mts., *Hall* 7608; Bonita Mdw., Tulare Co., *Hall & Babcock* 5181; Truckee ranger station, *L. S. Smith* 694.

Ref.—SCIRPUS PAUCIFLORUS Lightf. Fl. Scot. 1078 (1777), type loc. Highlands of Scotland.

4. **S. setaceus** L. Stems caespitose, 4 to 5 inches high, twice as high as the leaves, the horizontal rootstocks very slender; involucral bracts 2 to 4 lines long; spikelets 1 or 2 in a place, narrow-ovate, 1½ lines long; scales more or less dark brown with a broad green midvein; achenes elliptic-obovoid, ½ line long, flattish on one side, convex and somewhat angled on the other, longitudinally and rather regularly ribbed, finely and horizontally striate between the ribs, apiculate.

Moist places, Humboldt Co. Europe, Asia, Africa, Australia.

Loc.—Salmon Creek Valley, *Tracy* 4817 (det. M. L. Fernald).

Ref.—SCIRPUS SETACEUS L. Sp. Pl. 49 (1753), type European.

5. **S. nevadensis** Wats. Stems clustered from a creeping rootstock, 9 to 18 inches high; leaves ½ to ⅔ height of the stems, ⅓ to ⅔ line wide, channeled, involute; spikelets chestnut-brown, oblong-ovate, 4 to 10 lines long, 3 or 4 ("to

8'') in a terminal sessile cluster; involucral bract narrowly linear or acicular, ½ to 1¼ inches long; scales ovate, obtusish, not awned; achenes nearly circular or round-ovate, flat on one face, rounded or hemispheric on the other; bristles 1 to 3, less than half the length of the achene.

Moist alkaline lands, east of the Sierra Nevada. Nevada to Washington.

Locs.—Mono Lake, *Brewer;* Amedee, *Davy* 3311.

Ref.—SCIRPUS NEVADENSIS Wats. Bot. King, 360 (1871), type loc. Soda Lake, Carson desert, Nev., *Watson* 1213.

6. **S. acutus** Muhl. TULE. (Fig. 19.) Stems arising from stout creeping rootstocks, terete or very obtusely trigonous above, 3 to 9 feet high, leafless or with a short terete leaf from the upper basal sheath; inflorescence apparently lateral, 1 to 5 inches long; involucral bract stout, shorter than the inflorescence; spikelets 3 to 6 lines long, numerous, congested capitate, or in an irregular umbel with unequal rays; scales ovate, ciliate, shortly awned, ¼ to ⅓ longer than the achene; bristles 6, slender, retrorsely barbellate, slightly shorter than or about equaling the achene; style 2-cleft; achene lenticular, gray, abruptly mucronate.

Fig. 19. SCIRPUS ACUTUS Muhl. *a*, paniele of spikelets, × 1; *b*, scale, × 4; *c*, achene, × 4; *d*, achene and bristles, × 7.

Salt and freshwater marshes and borders of lakes and streams, very common: California to British Columbia, Newfoundland and Arizona.

Tax. Note.—The achene in this species is ⅓ larger than in S. validus and the scales nearly twice as long. The umbels are denser in S. acutus and the stems harder.

Econ. Note.—It is our estimate that originally there were in California about 250,000 acres of tule lands; much of this area has now been reclaimed to cultivation. Tule stems were used by the native tribes to build their balsas or small boats and to weave mats. At the present day the stems are used for packing nursery stock for shipment, thatching hay-stacks, and as a source of potash.

Locs.—Victorville, *Parish* 10561; Tehachapi, *Greene;* Bakersfield, *Davy* 2914; Hetch-Hetchy, *Jepson* 3415; Long Valley, Lassen Co., *Jepson* 7786; Gazelle, Shasta Valley, *Goldsmith* 16; Samoa, Humboldt Bay, *Tracy* 2595; Suisun Marshes, *Jepson* 2460a.

Refs.—SCIRPUS ACUTUS Muhl.; Bigelow, Fl. Bost. 15 (1814), type loc. Fish Pond, Cambridge, Mass.; Fern. Rhod. 22:55 (1920). *S. occidentalis* Chase, Rhod. 6:68 (1904). *S. lacustris* var. *occidentalis* Wats. Bot. Cal. 2:218 (1880), type from western America.

7. **S. californicus** Britton. CALIFORNIA BULRUSH. Similar to S. occidentalis; umbel irregular, looser, its rays more slender, up to 4 inches long; spikelets dark reddish brown, cylindric or narrow-ovate, (3 or) 4 to 5 lines long; scales short-aristate; bristles 2, 3 or 4, ribbon-shaped, dark red, conspicuously short-hairy or somewhat plumose.

Marshes, California to Florida and South America.

Locs.—Oceanside, *Parish* 4455; Oak Knoll, Los Angeles Co., *Braunton* 659; Alvarado, *Jepson;* Vallejo, *M. Grace Rowe;* Suisun Marshes, *Jepson* 2460.

Refs.—SCIRPUS CALIFORNICUS BRITTON Trans. N. Y. Acad., 11:79 (1892). *Elytrospermum californicum* C. A. Mey. Mem. Sav. Etr. Petersb. 1:201, t. 2 (1830), type from California. *S. tatora* Kunth, Enum. Pl. 2:166 (1837), type loc. Peru.

8. **S. validus** Vahl. GREAT BULRUSH. Stems 3 to 8 feet high from stout scaly rootstocks; basal sheaths soft, the hyaline margins soon laccrate; spikelets narrow-ovate, in clusters of 1 to 5, borne on the rays of a lax panicle; scales equaling or but little longer than the achene, roundish, ciliate, mucronate; bristles 4 or usually 5 or 6, retrorsely barbed, shorter than or usually slightly longer than the achene; style 2-cleft; achene broadly obovoid, plano-convex, apiculate.

Widely distributed in North America. Little known in California.

Locs.—Oro Fino, *Butler* 137; Russian River, s. Mendocino Co., *Heller* 5827 (det. C. V. Piper); Chinatown firth, Santa Ana River, *F. M. Reed* (acc. Agnes Chase). Probably overlooked elsewhere in California.

Refs.—SCIRPUS VALIDUS Vahl, Enum. Pl. 2:268 (1806), type from the West Indies. *S. lacustris* of Am. authors.

9. **S. americanus** Pers. THREE SQUARE. (Fig. 20.) Stems ¾ to 2 feet high, very slender, triangular, somewhat leafy; leaves short (the blade 1 to 3 inches long); involucral bract solitary, pungent, 1 to 4 inches long; spikelets 1 to 6, oblong-ovate, 3 to 7 lines long, borne in a single crowded sessile cluster; scales dark-brown, usually conspicuously tipped with a stout pale-colored awn about a line long; achene flat on one face, convex on the other and somewhat obscurely keeled; bristles 2 to 6, very unequal, the longer about as long as the achene.

Marshy, often brackish, places, occasional throughout California. North America, Chile.

Locs.—Panamint Cañon, *Hall & Chandler* 7041; Owens Lake, *Jepson* 5115; Mt. Pinos, *Hall* 6627; Eureka, *Tracy* 1765; Castle Rock, Sacramento River, *Goldsmith* 7; Honey Lake Valley, *Davy* 3286; Long Valley, Lassen Co., *Jepson* 7785.

Refs.—SCIRPUS AMERICANUS Pers. Syn. 1:68 (1805), type from the Carolinas. *S. pungens* Vahl, Enum. Pl. 2:255 (1806).

Fig. 20. SCIRPUS AMERICANUS Pers. *a*, cluster of spikelets, × 1; *b*, scale, × 5; *c*, achene and bristles, × 5.

10. **S. olneyi** Gray. OLNEY BULRUSH. (Fig. 21.) Stems from the bulbous nodes of running rootstocks, 2 to 5 feet high or more, stout, triquetrous, sheathed at base, leafless or with a single very short leaf; involucral bract 1 to 1¼ inches long; spikelets 2 to 26 in a single crowded sessile cluster, oblong-ovate, 2 to 5 lines long; scales brown, elliptic, membranous, obtuse, glabrous or slightly ciliate; style 2-cleft; achene obovate, flattish on one side, convexish on the other, beaked, smooth.

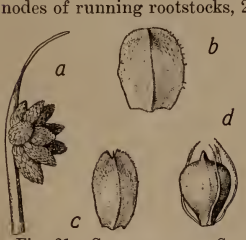

Fig. 21. SCIRPUS OLNEYI Gray. *a*, cluster of spikelets, × 1; *b*, scale (lower), × 5; *c*, scale from a different plant (upper), × 5; *d*, achene and bristles, × 5.

Common in brackish marshes: California and Oregon, east to the Atlantic.

Locs.—Klamath Hot Sprs., *Goldsmith* 23; Suisun, *C. F. Baker* 3243; Newark, *Davy* 1109; Death Valley, *Jepson* 6939.

Refs.—SCIRPUS OLNEYI Gray, Jour. Bost. Soc. Nat. Hist. 5:30 (1845), type loc. Seekonk River, R. I., *Olney;* Jepson, Fl. W. Mid. Cal. 87 (1901).

11. **S. campestris** Britton. BULL TULE. (Fig. 22.) Stems 1 to 3 feet high, stout, acutely triangular, the point of junction with the slender rootstock often

enlarged into hard woody tubers; leaves equaling or exceeding the stem, keeled, flat or deeply channeled, 2 to 4 lines wide; involucre of few unequal spreading foliaceous bracts 3 to 13 inches long, one much the longer and more erect; inflorescence terminal, the spikelets in clusters of 1 to 3, the clusters congested-capitate or commonly somewhat umbellate with unequal rays; rays ¼ to 1½ inches long; spikelets ovate or oblong-ovate, acute, 6 to 10 lines long; scales thinly scarious, obscurely puberulent or subglabrous, keeled, bifid or lacerate, with a short soon recurved subulate awn between the teeth; bristles 2 to 6, minutely and retrorsely scabrous, shorter than the achene; style 2-cleft; achene round-obovate, sublenticular, obtuse or truncatish, slightly apiculate, dark brown, shining.

Fig. 22. SCIRPUS CAMPESTRIS Britton. *a*, cluster of spikelets, × 1; *b*, scale, × 3; *c*, achene, × 3; *d*, achene and bristles, × 3.

Salt marshes and moist alkaline soils: throughout California. North to Oregon and east to New Jersey.

Locs.—Ne. Modoc Co., *Manning;* Samoa, Humboldt Bay, *Tracy* 3099; Napa, *Jepson;* Suisun Marshes, *Jepson* 2459; Benicia, *Jepson* 7436; Alvarado, *Jepson;* Bakersfield, *Davy* 1826; San Bernardino, *Parish;* Imperial, *Parish* 8376. The typical form has whitish spikelets. The var. paludosus Fern. has drab or castaneous spikelets but does not differ otherwise. It has much the same range as the species in California.

Refs.—SCIRPUS CAMPESTRIS Britton, Ill. Fl. ed. 1, 1:267 (1896), type North American. *S. maritimus* Wats. Bot. Cal. 2:218 (1880), in part. *S. robustus* Jepson, Fl. W. Mid. Cal. 87 (1901). Var. *compactus* Davy in Jepson l.c. 88, type loc. Stege, *Davy* 4075; spikelets congested into dense heads. Var. *paludosus* Fern. Rhod. 2:241 (1900). *S. paludosus* Nelson, Bull. Torr. Club, 26:5 (1899), type loc. Granger, Wyo., *Nelson.* *S. pacificus* Britton; Parish, Bull. S. Cal. Acad. 4:8 (1905), type loc. s. Cal. coast.

12. **S. fluviatilis** Gray. Similar to S. campestris; bract of the inflorescence exceedingly elongated; scales minutely puberulent, subulate awn recurved; bristles exceeding the achene; achene brownish or drab, narrow-obovoid, flattish on one face, strongly carinate-keeled on the other, obscurely apiculate, shortly attenuate at base.

Borders of lakes and streams, probably throughout northern California but rarely collected. East to New Jersey.

Locs.—Honey Lake, *Davy* 3313; Sutter Co., *Copeland* 3263.

Refs.—SCIRPUS FLUVIATILIS Gray, Man. 527 (1848). *S. maritimus* var. *fluviatilis* Torr. Ann. Lyc. N. Y. 3:324 (1836), type loc. w. New York, *Gray.*

13. **S. microcarpus** Presl. PANICLED BULRUSH. (Fig. 23.) Stems from stout creeping rootstocks, stout, triangular, leafy, 2 to 5 feet high; leaves flat, 4 to 8 lines wide; margins scabrid; involucre of several spreading foliaceous bracts, about 1 to 2 times as long as the inflorescence; spikelets 1 to 5 in terminal and axillary clusters, the clusters in an umbellate compound panicle; panicle large and open, the rays 1 to 6 inches long, the raylets ¼ to ¾ inch long; spikelets narrow-ovate, greenish or lead-colored, 1 to 2½ lines long; scales ovate, membranous, with broad green midrib; bristles 4, barbed to the base; stamens 2; style 2-cleft; achene pale, plano-convex, not angled on the back, abruptly short-beaked, ½ line long.

Common along streams and in fresh-water marshes: California to Alaska and Newfoundland.

Locs.—Cuyamaca Mts. (Bot. Cal. 2:219); Carmel, *Ferguson* 287; Mt. Hermon, Santa Cruz Mts., *M. Grace Rowe;* Lake Pilarcitos, San Mateo Co., *Davy* 765; Mt. Tamalpais, *Davy;* Guerneville, *Davy;* Moore Creek, Howell Mt., *Jepson* 6841; Mt. St. Helena, *Jepson* 7667; Eureka, *Tracy* 4628; Sisson, *Goldsmith* 24; Ft. Bidwell, Modoc Co., *Jepson* 7922; Sierra Valley, *Jepson* 8054a; Jackson, *Hansen* 637; Kennedy Mdws., Tuolumne Co., *A. L. Grant* 121, 448; Confidence, Tuolumne Co., *Jepson* 7696; Alder Creek, Yosemite Park, *Jepson* 4330a.

Refs.—SCIRPUS MICROCARPUS Presl, Rel. Haenk. 1:195 (1828), type loc. Nootka Sound, Vancouver Isl. *S. sylvaticus* var. *digynus* Boeckl. Linnaea, 36:727 (1870).

14. **S. congdonii** Britton. Similar to S. microcarpus, but panicle less diffuse, its rays 3 to 6, 2 to 3½ inches long; spikelets densely capitate at the ends of the rays; style 3-cleft; bristles rather longer than the achene; achene oblong-obovate, flat on one face, angled on the back.

Sierra Nevada; very little known and rarely collected.

Locs.—Pine Ridge, Fresno Co., acc. Britton; Plumas Co., acc. Britton.

Refs.—SCIRPUS CONGDONII Britton, Torreya, 18:36 (1918), type loc. upper San Joaquin River, Madera Co., *Congdon. S. atrovirens* Wats. Bot. Cal. 2:219 (1880).

Fig. 23. SCIRPUS MICROCARPUS Presl. *a*, panicle, × ½; *b*, spikelet, × 6; *c*, scale, × 9; *d*, achene, × 9.

15. **S. lineatus** Michx. Stems slender, triangular, from a stout rootstock, densely leafy at base, less leafy above, 1½ to 3 feet high; leaves flat, 3 to 6 lines wide, scabrous-margined; panicle of umbels compound, 2 to 5 inches long, the spikelets mostly solitary at the ends of the raylets, the very slender rays becoming pendulous; involucral bracts much shorter than the inflorescence; spikelets reddish brown, short-cylindric, (2 or) 4 to 6 lines long; scales ovate or oblong, short-awned, membranous with a green midvein; bristles 6, weak, entangled, smooth, equaling or exceeding the scales; stamens 3; style 3-cleft; achene obovoid, flat on one face, convex-ridged on the other, short-beaked, ½ line long.

Dry hills, Siskiyou Co. North to Oregon and east to the Atlantic.

Locs.—Yreka, *Butler* 857. Grants Pass, Oregon, *Howell.*

Ref.—SCIRPUS LINEATUS Michx. Fl. Bor. Am. 1:32 (1803), type from the Carolinas.

16. **S. criniger** Gray. (Fig. 24.) Stems ¾ to 3 feet high, triangular and striate; leaves 1½ to 4 inches long, 1½ to 2½ lines wide; spikelets 9 to 18, 5 to 7 lines long, congested in a sessile head; filaments slender, much exserted and exceeding the 6 very long bristles; style 3-cleft; achene oblong, sulcate-triangular, shortly beaked, 1 line long.

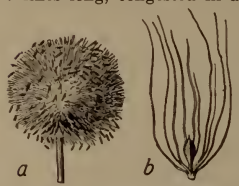

Fig. 24. SCIRPUS CRINIGER Gray. *a*, head of flowers, × 1; *b*, achene and bristles, × 3.

High mountains, Sierra Nevada, north to Siskiyou Co., thence south to Mendocino Co.

Locs.—Monarch Creek, Tulare Co., *Hall & Babcock* 5699; Peregoy Mdw., Yosemite Park, *Jepson* 4331; Mt. Dana, *Congdon;* Kennedy Lake, Tuolumne Co., *A. L. Grant* 508; Heather Lake, El Dorado Co., *Jepson* 8175; Placer Co., *Carpenter;* Siskiyou Mts., *Blasdale* (bristles almost smooth).

Ref.—SCIRPUS CRINIGER Gray, Proc. Am. Acad. 7:392 (1867), type loc. Red Mt., n. Mendocino Co., *Bolander.*

5. ERIOPHORUM L. COTTON-SEDGE.

Bog perennials with triangular or nearly terete stems from creeping rootstocks. Leaves linear or the uppermost reduced to sheaths. Spikelets terminal on a leafy or naked stem, solitary or clustered or umbellate, subtended by an involucre of leaf-like bracts or none. Scales membranous, 1 to 5-nerved. Perianth-bristles numerous, filiform, silky-white, becoming greatly elongated in fruit. Stamens 1 to 3. Style very slender and elongated, 3-cleft. Achene triangular.—Species 10, northern hemisphere. (Greek erion, wool, phora, crop, refering to the woolly heads.)

Bibliog.—Fernald, M. L., N. Am. Species of Eriophorum (Rhod. 7:81-92, 129-136,—1905).

1. **E. gracile** Koch. SLENDER COTTON-SEDGE. Stems subtercte, weak and very slender, 1 to 2 feet high, with one or more erect, very narrow, triangular-channeled leaves; involucre of a single erect colored bract much shorter than the inflorescence; rays 4 to 6 lines long, slightly nodding, roughish-puberulent; spikelets 2 to 5, oblong, 3 to 4 lines long; scales lead-color or blackish; perianth bristles 6 to 7 lines long in fruit.

Cold swamps, San Francisco and Sonoma Co. northward. Boreal regions around the earth.

Locs.—Santa Rosa (Bot. Cal. 2:220); San Francisco (Zoe, 2:378). Var. CAURIANUM Fern. (Fig. 25.) Scales straw-color or brownish.—Northern Sierra Nevada and northward; Grass Lake near Luther Pass, El Dorado Co., *Jepson* 8090; Sisson, *Jepson.*

Refs.—ERIOPHORUM GRACILE Koch in Roth, Cat. Bot. 2:259 (1800), type European. Var. CAURIANUM Fern. Rhod. 7:87 (1905), based on spms. from Ore. (*Cusick*) and Cal. (Sierra Co., *Lemmon*, and Mt. Shasta, *Brown*).

Fig. 25. ERIOPHORUM GRACILE Koch var. CAURIANUM Fern. Cluster of spikelets in fruit, × 1.

6. HEMICARPHA Nees & Arn.

Dwarf tufted annuals, with almost filiform stems and leaves. Spikelets small, terminal, terete, solitary or clustered, subtended by a 1 to 3-leaved involucre. Scales enclosing a minute hyaline bractlet between the flower and the axis of the spikelet. Perianth

none. Stamen 1. Style 2-cleft. Achene subterete.—Species 3. (Greek hemi, half, and karpos, chaff, in reference to the inner bractlet.)

Bibliog.—Coville, F. V., Genus Hemicarpha in N. Am. (Bull. Torr. Club 21:34–37,—1894). Britton, N. L., Genus Hemicarpha (Ill. Fl. ed. 2, 1:339–340,—1913).

Scales spreading only at the tip or erect, little exceeding the achenes .....1. *H. micrantha.*
Scales spreading, 2 to 3 times as long as the achenes .....2. *H. occidentalis.*

1. **H. micrantha** Pax. Stems ¾ to 1¼ inches high, sheathed at base with 1 or 2 short filiform leaves; involucral bract ½ to 6 lines long; spikelets 1 to 3, ovate, reddish-brown, 1 to 1½ lines long; scales cuneate-obovate, short-acuminate and slightly spreading at the tip or erect, little longer than the (¼ line long) achene; bractlet adherent to the achene.

San Diego Co. and Sierra Nevada foothills. Washington to the Atlantic and South America.

Locs.—Jacksonville bridge, Tuolumne River, *A. L. Grant* 580; San Diego, *Orcutt* (acc. Gray Herb.). Var. **aristulata** Cov. Stems 4 to 8 inches high; spikelets conspicuously squarrose by reason of the abruptly attenuate scales; achenes black.—Great Plains region; also Washington and California acc. Britton, Ill. Fl. ed. 2, 1:340 (1913).

Refs.—HEMICARPHA MICRANTHA Pax; Engler & Prantl, Nat. Pflzr. 2²:105 (1887). *Scirpus micranthus* Vahl, Enum. Pl. 2:254 (1806). *H. subsquarrosa* Wats. Bot. Cal. 2:220 (1880). Var. ARISTULATA Cov. Bull. Torr. Club 21:36 (1894), type from Texas, *Nealley*. *H. aristulata* Smyth, Trans. Kans. Acad. Sci. 16:163 (1899); Nelson, Bull. Torr. Club, 29:400 (1902).

2. **H. occidentalis** Gray. (Fig. 26.) Similar; stems 1 to 2 inches high; spikelets greenish, broadly ovate; scales ¾ to 1 line long, the body oblong or lanceolate, 3 or 4-nerved, abruptly tapering into a spreading awn-like tip 1 to 1½ times as long; bractlet not adherent to the achene; achene brownish, narrow-obovoid, somewhat flattened.

Middle altitudes: cismontane Southern California; Sierra Nevada. North to Washington.

Locs.—Lake Surprise, Mt. San Jacinto, *F. M. Reed* 2443; Bluff Lake, San Bernardino Mts., *Parish* 3268; Yosemite, *Congdon;* Jacksonville Bridge, Tuolumne River, *A. L. Grant* 580a.

Ref.—HEMICARPHA OCCIDENTALIS Gray, Proc. Am. Acad. 7:391 (1868), type loc. Yosemite, *Bolander*.

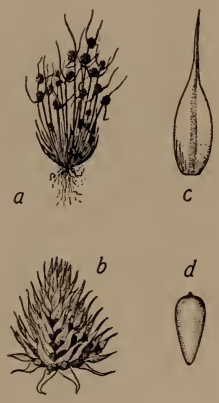

Fig. 26. HEMICARPHA OCCIDENTALIS Gray. *a*, entire plant, × 1; *b*, spikelet, × 8; *c*, scale, × 18; *d*, achene, × 18.

7. SCHOENUS L.

Mostly perennials with rush-like tufted rigid stems. Leaves semi-terete, basal, the sheaths dark-colored. Spikelets 1 to 6-flowered, aggregated in a terminal cluster. Scales in 2 ranks, the lower ones empty, the upper with perfect or pistillate flowers, the uppermost with staminate flowers or empty. Perianth of 3 to 6 plumose or smooth bristles or none. Stamens usually 3. Style-branches 3. Achene 3-angled, without a tubercle.—Species 61, mostly in New Zealand and Australia but also occurring in North and South America, Europe and Africa. (Greek schoinos, a rush.)

Fig. 27. SCHOENUS NIGRICANS L. *a*, cluster of spikelets, × 1; *b*, achene, × 5.

1. **S. nigricans** L. BLACK GALINGALE. (Fig. 27.) Perennial; stems 10 to 20 inches high, surpassing the erect rigid pungent leaves; heads 5 to 7 lines high, dark chestnut-color; spikelets flattened; bristles naked in our form; achene white.

Alkaline soil, Southern California. Nevada, Texas, Florida. Europe, Africa, Asia.

Locs.—Lone Pine Cañon, Cajon Pass, *Parish* 2058; Arrowhead Sprs., *Geo. B. Grant;* Furnace Creek, Death Valley (acc. Contrib. U. S. Nat. Herb. 4:213).

Ref.—SCHOENUS NIGRICANS L. Sp. Pl. 43 (1753), type European.

8. **CLADIUM** P. Br. SAW-GRASS.

Very tall leafy perennials. Stems terete (in ours), from stout rootstocks. Leaves much elongated, serrate on the margin and folded on the midrib so as to be channeled above. Spikelets small, few-flowered, borne in terminal and lateral compound panicles and consisting of several loosely imbricated scales; lower scale empty, the middle one or two bearing staminate flowers, the upper one usually perfect and fertile. Stamens in ours 2. Style 2 or 3-cleft, deciduous. Achene ovoid or globose, without tubercle.—Species 45, tropical and temperate regions. (Diminutive of Greek klados, a branch, referring to the branched inflorescence.)

1. **C. mariscus** R. Br. Stems numerous, stout, 6 to 10 feet high, forming very dense and heavy hummocks; leaves 4 to 7 feet long, 4 to 5 lines broad; panicles diffuse, drooping, the lateral ones 4 to 8 in number, from the axils of short sheathing leaves; spikelets narrowly oblong, 2 lines long, in clusters of 2 or 3; achene brown, cylindric-ovate, 1 to 1¼ lines long.

Moist ground, south bases San Gabriel and San Bernardino mountains; Inyo Co. Southern Nevada. All continents.

Locs.—Upland (acc. *Parish*, Bot. Gaz. 65:335); Hanaupah Cañon, Panamint Mts., *Jepson* 7002; Furnace Creek (acc. Coville, Contrib. U. S. Nat. Herb. 4:213,—1893).

Refs.—CLADIUM MARISCUS R. Br. Prodr. Fl. Nov. Holl. 1:236 (1810). *C. mariscus* var. *californicum* Wats. Bot. Cal. 2:224 (1880), type loc. San Gabriel, *Brewer*.

9. **RYNCHOSPORA** Vahl.

Chiefly perennials with erect more or less leafy and triangular stems from rootstocks. Spikelets ovate, globular, or fusiform, variously clustered; scales plane or a little concave, not keeled, the uppermost subtending imperfect flowers. Perianth of 1 to 20 bristles. Stamens commonly 3 (in ours usually 2). Style 2-cleft. Achene lenticular or globular, crowned by the persistent base of the style.—Species about 189, tropics and subtropic regions of both hemispheres. (Greek rhyncos, snout, and spora, seed.)

1. **R. alba** Vahl. WHITE-BEAK RUSH. Perennial; stems almost filiform, ½ to 2 feet high; leaves narrowly linear or almost bristle-like; spikelets disposed in a head-like terminal corymb (and usually 1 or 2 lateral ones), white or whitish, becoming tawny with age, perfecting only a single flower; bristles 9 to 12 (or 20); tubercle flattened, triangular-subulate, nearly as long as the achene.

Bogs, North Coast Ranges, rare in California. North America, Europe, Asia.

Loc.—Mendocino Co., *Congdon* (acc. Fernald and MacBride).

Refs.—RYNCHOSPORA ALBA Vahl, Enum. Pl. 2:236 (1806). *Schoenus albus* L. Sp. Pl. 44 (1753), type north European.

10. **CAREX** L. Sedge.

By K. K. Mackenzie[1]

Grass-like sedges, perennial by rootstocks. Culms (stems) mostly triangular, often strongly phyllopodic (leafy at base) or aphyllopodic (not leafy at base). Leaves 3-ranked, the upper (bracts) elongate or short, and subtending the spikes of flowers or wanting. Flowers monoecious or sometimes dioecious. Spikes 1 to many, either wholly pistillate, wholly staminate, androgynous or gynaecandrous, sessile or peduncled, the base of the peduncle often with a perigynium-like or spathe-like organ (clado-prophyllum) surrounding it. Perianth none. Stamens 3 (or rarely 2). Achene 3-angled, lenticular or plano-convex, completely enclosed by the sac-like perigynium.—Species more than 1000, all continents, but least developed in the tropics. (The Latin name.)

Tax. note.—The style is either (1) jointed with the achene and withering and at length deciduous, as in most sections, or (2) continuous with the achene, persistent, indurated and not withering, as in Sects. 30, 33, 34, and sometimes in Sect. 31. The racheola is occasionally developed.

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[1] The ranges for California and the indications of altitude have been in large part written by W. L. Jepson on the basis of determinations by Mr. Mackenzie. The references to the literature under the species have also been somewhat modified to conform to the general usage in this work.—W. L. J.

A. Spike one, androgynous, bractless; perigynia glabrous, beaked, the beak with closed suture at apex dorsally.

Achenes triangular; stigmas three, rarely two.
Pistillate scales persistent; perigynia inflated, sessile, not becoming reflexed....1. INFLATAE.
Pistillate scales deciduous; perigynia not inflated, stipitate, at least the lower reflexed at maturity ....2. ATHROCHLAENAE.
Achenes lenticular; stigmas two....3. CAPITATAE.

B. Spikes one to many; if one, not as in A.

1. *Achenes lenticular and stigmas two; lateral spikes sessile; terminal spike partly pistillate, or if staminate the lateral spikes short or heads dioecious.*

Perigynia not white-puncticulate.
Rootstocks long-creeping, the culms arising singly or few together; perigynia with beak obliquely cut, at most bidentulate.
Spikes densely aggregated into a globose or ovoid head, appearing like one spike.... 4. FOETIDAE.
Spikes, at least the lower, distinct....5. DIVISAE.
Cespitose or rootstocks short-creeping; perigynia obliquely cut to deeply bidentate.
Spikes androgynous (i.e., staminate flowers uppermost).
Perigynia abruptly contracted into the beak.
Spikes few (usually ten or less); perigynia green or tinged with reddish-brown. 6. MUHLENBERGIANAE.
Spikes numerous; perigynia yellowish or brownish at flowering.
Perigynia yellowish; opaque part of leaf-sheath usually transversely rugulose. 7. MULTIFLORAE.
Perigynia brownish; opaque part of leaf-sheath not transversely rugulose. 8. PANICULATAE.
Perigynia tapering into the beak....9. STENORHYNCHAE.
Spikes gynaecandrous (i.e., pistillate flowers uppermost).
Perigynia at most thin-edged.
Perigynia spreading or ascending at maturity....10. STELLULATAE.
Perigynia appressed....11. DEWEYANAE.
Perigynia narrowly to broadly wing-margined....12. OVALES.
Perigynia white-puncticulate....13. CANESCENTES.

2. *Achenes triangular and stigmas three, or lenticular and stigmas two; if lenticular, lower lateral spikes conspicuously pedunculed, or terminal spike staminate and lateral spikes elongated.*

Staminate and pistillate spikes on different culms; stigmas 3, short....17. SCIRPINAE.
Staminate and pistillate spikes on the same culms.
Spike solitary.
Perigynia many-nerved, rounded and beakless at apex; stigmas 3, short.... 14. POLYTRICHOIDEAE.
Perigynia 2-keeled, not rounded at apex, beakless or beaked.
Perigynia glabrous; stigmas 3, elongated....15. FIRMICULMES.
Perigynia pubescent or puberulent; stigmas 3....16. FILIFOLIAE.
Spikes more than one.
Perigynia closely enveloping the achene, strongly tapering at base, pubescent or puberulent; bracts sheathless or nearly so; stigmas normally 3, long....18. MONTANAE.
Perigynia not as above; or if so, at least the lowest bract strongly sheathing.
Bracts (at least lowest) long-sheathing, more or less purplish-tinged, the blades absent or rudimentary; stigmas 3, early deciduous....19. DIGITATAE.
Lowest bract sheathless or long-sheathing; if long-sheathing its blade well-developed.
Lowest bract strongly sheathing: perigynia never strongly bidentate with stiff teeth.
Achenes lenticular; stigmas 2....20. BICOLORES.
Achenes triangular; stigmas 3.
Scales greenish or light reddish-brown or purplish tinged.
Rootstocks long-creeping; scales purplish tinged....21. PANICEAE.
Rootstocks not long-creeping; scales greenish to reddish-brown tinged.
Perigynia glabrous or hispidulous; leaves not pubescent.
Pistillate spikes erect on stiff peduncles....22. LAXIFLORAE.
Pistillate spikes slender on slender peduncles, the lower drooping....24. DEBILES.
Perigynia or leaves or both strongly pubescent....23. TRIQUETRAE.
Scales dark reddish-brown to blackish tinged....25. FRIGIDAE.
Lowest bract sheathless or sheathing; if sheathing, perigynia strongly bidentate with stiff teeth.

Perigynia or leaves or both pubescent; stigmas 3.....31. HIRTAE.
Neither perigynia nor leaves pubescent.
Style jointed with the achene, deciduous.
Achenes triangular; stigmas 3.
Lowest bract sheathless; perigynia not bidentate.
Pistillate spikes narrowly cylindric, elongated.....26. ANOMALAE.
Pistillate spikes ovoid, oblong or linear.....27. ATRATAE.
Lowest bract sheathing; perigynia bidentate.....32. EXTENSAE.
Achenes lenticular; stigmas 2.
Achenes not constricted in the middle.....28. ACUTAE.
Achenes constricted in the middle; scales sharp-pointed, three-nerved. 29. CRYPTOCARPAE.
Style persistent, continuous with the achene.
Perigynia nerveless, except for the marginal nerves; stigmas 3..... 30. TRACHYCHLAENAE.
Perigynia several to many-nerved.
Perigynia coarsely ribbed; stigmas 3 or 2.....33. PHYSOCARPAE.
Perigynia finely and closely ribbed; stigmas 3..... 34. PSEUDO-CYPEREAE.

1. Inflatae.

Pistillate scales 1-nerved; perigynia ovoid, inflated, tapering at apex; staminate part of spike scarcely conspicuous; achenes 1.25 to 1.5 mm. long.....1. *C. engelmanii.*
Pistillate scales 3-nerved; perigynia broadly ovoid, strongly inflated, abruptly minutely-beaked; staminate part of spike conspicuous; achenes 2 mm. long.....2. *C. breweri.*

2. Athrochlaenae.

Represented by one species in our range.....3. *C. nigricans.*

3. Capitatae.

Represented by one species.....4. *C. capitata.*

4. Foetidae.

Represented by one species in our range.....5. *C. vernacula.*

5. Divisae.

Rootstocks, slender, light-brownish; culms obtusely triangular, normally smooth; leaf-blades narrow, involute.....6. *C. douglasii.*
Rootstocks stout; culms acutely triangular, normally rough above.
Perigynia chestnut, thick, the beak about one-fifth as long as the body.....7. *C. simulata.*
Perigynia blackish in age, the beak one-third to one-half as long as the body.
Scales very dark chestnut-brown, shining; perigynia 3.5 to 4.5 mm. long, polished, scarcely hyaline at orifice.....8. *C. pansa.*
Scales lighter colored, dull; perigynia 3 to 4 mm. long, dull, strongly hyaline at orifice. 9. *C. praegracilis.*

6. Muhlenbergianae.

Densely cespitose; head orbicular or oblong-ovoid.....10. *C. hoodii.*
Rootstocks elongate; head linear, interrupted.....11. *C. tumulicola.*

7. Multiflorae.

Scales strongly hyaline-margined; sheaths normally not cross-rugulose.
Perigynia lanceolate-ovate, sharp-margined to base, membranaceous, straw-colored..... 12. *C. stenoptera.*
Perigynia ovate, truncate at base, short-beaked, sharp-margined above, not membranaceous, brownish-black at maturity.....13. *C. alma.*
Scales not strongly hyaline-margined; sheaths normally more or less cross-rugulose; perigynia straw-colored, yellowish or tawny at maturity, sharp-margined to base.
Perigynia 3.5 to 4.5 mm. long, the beak much shorter than the body; pistillate scales (except lowest) acute or cuspidate.
Ligule conspicuous, as long as wide; scales brownish-tinged; perigynia strongly nerved ventrally.....14. *C. densa.*
Ligule very short; scales reddish-brown-tinged.
Perigynia flat and nerveless or nearly so ventrally, the body sparingly serrulate above, contracted into a beak.....15. *C. vicaria.*
Perigynia low-convex and strongly nerved ventrally, the body strongly serrulate above, abruptly contracted into a beak.....16. *C. brevigulata.*
Perigynia 2.25 to 3.25 mm. long, the beak about length of the body; pistillate scales strongly awned.....17. *C. dudleyi.*

8. Paniculatae.

Leaf-blades 1.25 mm. wide; head little interrupted; perigynia 2 to 2.75 mm. long, shining, not concealed by the scales.....18. *C. diandra.*

Leaf-blades 2.5 to 6 mm. wide; head interrupted, compound; perigynia 3 to 4 mm. long, dull, concealed by the scales.....19. *C. cusickii.*

9. Stenorhynchae.

Perigynia 3 to 4 mm. long, the beak much shorter than the body; scales strongly dark-tinged.
Leaves clustered at base; sheaths not green and white mottled dorsally; culms slender.....20. *C. jonesii.*
Leaves not clustered at base, the lower blades much reduced; sheaths green and white mottled dorsally; culms stout.....21. *C. nervina.*
Perigynia 4 to 6 mm. long, the beak about length of body; scales not or scarcely dark-tinged.22. *C. stipata.*

10. Stellulatae.

Spikes more or less widely separate, not brownish-black.
Body of perigynium broadest near middle; beak with few weak serrulations.....23. *C. laeviculmis.*
Body of perigynium broadest near base; beak strongly serrulate.
Beak of perigynium bluntly bidentate, ¼ to ⅓ length of body, the ventral suture obsolete or inconspicuous; scale obtuse, ½ length of body of perigynium.....24. *C. interior.*
Beak of perigynium sharply bidentate, the ventral suture conspicuous.
Beak of perigynium chestnut-brown tipped; culms obtusely triangular; pistillate scales obtuse or obtusish, chestnut-brown tinged with broad shining margins and apex, rounded and not keeled, the midvein obscure at apex.
Spikes widely separate, the terminal long-clavate; perigynia 3.5 to 4 mm. long.25. *C. ormantha.*
Spikes approximate, the terminal short-clavate; perigynia 3.75 to 4.5 mm. long.26. *C. phyllomanica.*
Beak of perigynium reddish-brown tipped; culms sharply triangular; pistillate scales obtusish to cuspidate, yellowish-brown tinged, the margins and apex narrow, opaque or dull whitish, keeled with the sharp midvein which is prominent to apex.....27. *C. angustior.*
Spikes 3 to 5 in a small (6 to 10 mm. long), densely capitate, brownish-black head....28. *C. illota.*

11. Deweyanae.

Perigynia shallowly bidentate, 3.5 to 4 mm. long, the beak about ⅓ length of body.....29. *C. leptopoda.*
Perigynia deeply bidentate, 4 to 4.5 mm. long, the beak about ½ length of body.....30. *C. bolanderi.*

12. Ovales.

Sheaths green-striate opposite blades, except at mouth.....31. *C. feta.*
Sheaths white-hyaline opposite blades.
Sheaths strongly prolonged upward at mouth opposite blade in a very membranaceous appendage; perigynia and scales greenish.....32. *C. fracta.*
Upper sheaths (at least) concave or truncate at mouth opposite blades.
Beak of perigynium flat and serrulate to usually strongly bidentate tip.
Perigynia 3.5 to 5 mm. long, 2 to 3 mm. wide.
Perigynia thin with margins conspicuously wrinkled dorsally; culms 1 to 4 dm. high; spikes ovoid, densely capitate.....33. *C. straminiformis.*
Perigynia thick with margins not wrinkled dorsally; culms 3 to 9 dm. high; spikes oblong in an oblong head.....34. *C. multicostata.*
Perigynia 3 to 3.5 mm. long, 1 to 1.5 mm. wide.....35. *C. subfusca.*
Beak of perigynium terete toward apex, the upper 1 to 3 mm. smooth or nearly so.
Perigynia appressed, nearly or entirely covered by scales, the beaks not conspicuous in the spikes.
Culms slender; spikes in a flexuous nodding head.....36. *C. practicola.*
Culms stiff; spikes approximate in an erect head.
Culms 1 to 6 dm. high, the leaves not bunched near base; blades 2 to 3 mm. wide, flat; beak of perigynium not hyaline at orifice.....37. *C. tracyi.*
Culms 1 to 3 dm. high, in large tufts, the leaves bunched near base; blades 1.5 to 2 mm. wide, more or less involute; perigynium beak hyaline at orifice.
Perigynia oblong-ovate, rather strongly margined.....38. *C. phaeocephala.*
Perigynia linear-lanceolate, very narrowly margined, boat-shaped.....39. *C. leporinella.*
Upper part of perigynia conspicuous in the spikes, not covered by scales.
Perigynia lanceolate, 5.5 to 8.5 mm. in length, 3 to 5 times as long as wide.
Spikes about three, not capitate; scales little more than ½ length of perigynia.40. *C. davyi.*
Spikes 6 to 12, capitate; scales equaling bodies of perigynia....41. *C. specifica.*

Perigynia ovate or if lanceolate shorter than 3.5 mm. in length.
Lower bracts leaflet-like, much exceeding head.
Perigynia with the beak ferruginous at orifice, bidentate; lowest bract appearing like a continuation of the culm.....42. *C. unilateralis.*
Perigynia with the beak hyaline at orifice, bidentulate; lowest bract not appearing like a continuation of the culm.....43. *C. athrostachya.*
Lower bracts scale-like, much shorter than or slightly exceeding head.
Perigynia with membranaceous or submembranaceous walls.
Perigynia thin and flat save where distended by achene.
Perigynia 3.5 to 5 mm. long; culms slender.....44. *C. festivella.*
Perigynia 4.5 to 6 mm. long; culms low, ascending or decumbent. 45. *C. nubicola.*
Perigynia strongly plano-convex at maturity.
Perigynia nerveless ventrally or with impressed nerves..... 46. *C. pachystachya.*
Perigynia with conspicuously raised nerves on inner face.
Perigynia conspicuously hyaline-tipped; spikes densely capitate.....47. *C. abrupta.*
Perigynia reddish-tipped; spikes more or less strongly separate. 48. *C. mariposana.*
Perigynia with thick, firm walls.
Perigynia very small (2.25 to 3.5 mm. long).
Margins of perigynia entire (or very obscurely subserrulate)..... 49. *C. integra.*
Margins of perigynia strongly serrulate.....50. *C. teneraeformis.*
Perigynia longer (3.5 mm. long or more).
Lower bracts (at least) strongly ampleetant; beaks of perigynia and scales little reddish-tinged.....51. *C. amplectens.*
Bracts not amplectant; beaks of perigynia and scales strongly reddish-tinged.
Perigynia strongly nerved ventrally, the nerves prominent; scales with sharply defined midvein.
Sterile shoots not conspicuous; lower bladeless sheaths short; culms slender; scales mostly acute, reddish-brown..... 52. *C. harfordii.*
Sterile shoots numerous, elongate; lower bladeless sheaths very long; culms very slender; scales cuspidate or short-awned, yellowish-brown....53. *C. montereyensis.*
Perigynia nerveless or very obscurely nerved ventrally.
Perigynia with a few raised nerves dorsally; coastal species.
Spikes strongly capitate; leaf-blades averaging 2.5 to 3 mm. wide; culms 3.5 to 12 dm. high..... 54. *C. sub-bracteata.*
Spikes not capitate, the head slender; leaf-blades averaging 1.5 to 2 mm. wide; culms 1 to 6 dm. high..... 55. *C. gracilior.*
Perigynia many-striate or with impressed nerves dorsally; species of the Sierra Nevada.
Spikes not few-flowered; culms slender; leaves not clustered, the blades long.....56. *C. pachycarpa.*
Spikes 6 to 12-flowered; culms stiff; leaves clustered, the blades short.....57. *C. paucifructus.*

13. Canescentes.

Spikes androgynous; perigynia unequally biconvex.....58. *C. disperma.*
Spikes gynaecandrous; perigynia plano-convex.
Perigynia broadest near middle, short-beaked, smooth or little roughened.....59. *C. canescens.*
Perigynia ovate, broadest near the base; beak conspicuous, strongly serrulate....60. *C. arcta.*

14. Polytrichoideae.

Represented by one species.....61. *C. leptalea.*

15. Firmiculmes.

Not stoloniferous; culms smooth, terete; leaf-blades 1.5 mm. wide; bracts long-awned..... 62. *C. multicaulis.*
Stoloniferous; culms very rough, triangular; leaf-blades 2 to 3.5 mm. wide; bracts not long-cuspidate.....63. *C. geyeri.*

16. Filifoliae.

Represented by one species in our range.....64. *C. exserta.*

17. Scirpinae.

Represented by one species in our range.....65. *C. gigas.*

18. Montanae.

Basal spikes not developed.....66. *C. inops.*
Basal spikes present.
Perigynia finely many-ribbed as well as strongly 2-keeled.
Scales purplish-tinged, obtuse to cuspidate; body of perigynium globose; staminate spikes many-flowered; basal pistillate spikes on elongated very slender peduncles. 67. *C. globosa.*
Scales reddish-brown tinged, cuspidate or long-awned; body of perigynium oval; staminate spikes few-flowered; basal pistillate spikes on short, erect peduncles..... 68. *C. brainerdii.*
Perigynia strongly 2-keeled, otherwise nerveless.
Bract of lowest non-basal pistillate spike leaflet-like, exceeding culms, if at all colored, purplish-brown tinged at base.
Perigynia 2.5 to 3 mm. long, the beak 0.25 to 0.75 mm. long, shallowly bidentate..... 69. *C. brevipes.*
Perigynia 3 to 4.5 mm. long, the beak 0.75 to 1.50 mm. long, bidentate....70. *C. rossii.*
Bract of lowest non-basal pistillate spike squamiform and shorter than culm or, if longer, auriculate and strongly reddish-brown tinged at base.....71. *C. brevicaulis.*

19. Digitatae.

Represented by one species in our range.....72. *C. concinnoides.*

20. Bicolores.

Perigynia short-tapering at apex, straw-colored, 2.5 to 3.75 mm. long; achenes strongly apiculate.....73. *C. salinaeformis.*
Perigynia rounded or truncate at apex, orange-colored or white-pulverulent, smaller; achenes minutely apiculate.
Mature perigynia whitish, ellipsoidal, not fleshy or translucent, rather obscurely ribbed; scales appressed.....74. *C. hassei.*
Mature perigynia orange or brownish, broader, fleshy or translucent, strongly ribbed; scales divaricate at maturity.....75. *C. aurea.*

21. Paniceae.

Perigynia beakless or nearly so; bract sheaths short; plant glaucous; leaf-blades narrow, involute.....76. *C. livida.*
Perigynia strongly beaked; bract sheaths long; plant not glaucous; leaf-blades broad, flat..... 77. *C. californica.*

22. Laxiflorae.

Represented by one species in our range.....78. *C. hendersonii.*

23. Triquetrae.

Lowest bract sheathless or very short-sheathing; perigynia glabrous, strongly ribbed or nerved.
Perigynia ovoid, 3.5 to 4.25 mm. long, abruptly short-beaked, the sides several-nerved. 79. *C. flaccifolia.*
Perigynia ovoid-lanceolate, 3.75 to 5 mm. long, tapering into the beak, the sides strongly ribbed.....80. *C. whitneyi.*
Lowest bract long-sheathing; perigynia hairy, faintly nerved or nerveless.
Leaf-blades hairy; spikes oblong or short-oblong, the upper approximate.
Perigynia 4 to 5 mm. long, round-tapering at base, finely many-nerved..... 81. *C. gynodynama.*
Perigynia 3.5 to 4 mm. long, tapering at base, 2-keeled, obscurely striate..... 82. *C. hirtissima.*
Leaf-blades not hairy; pistillate spikes linear, widely separate.....83. *C. triquetra.*

24. Debiles.

Represented by one species in our range.....84. *C. mendocinensis.*

25. Frigidae.

Perigynia triangular or slightly flattened, the beak bidentulate; scales obtusish, the midvein not prominent at apex.
Spikes widely separate, the staminate one strongly overtopping the uppermost pistillate one; perigynia triangular, 3.5 mm. long or less.....85. *C. lemmonii.*
Uppermost pistillate spikes bunched, little exceeded by the staminate one; perigynia compressed-triangular, longer.
Pistillate spikes oblong; scales reddish-brown.....86. *C. luzulina.*
Pistillate spikes linear-oblong; scales dark-tinged.....87. *C. ablata.*
Perigynia strongly flattened, the beak bidentate; scales sharp-pointed with midvein prominent to apex.
Perigynia glabrous; scales smooth; bract sheaths strongly enlarged upward; leaf-blades very leathery.....88. *C. luzulaefolia.*
Perigynia sparsely hairy; scales more or less hairy; bract sheaths scarcely enlarged upward; leaf-blades not leathery.....89. *C. fissuricola.*

26. Anomalae.

Represented by one species in our range.....90. *C. amplifolia.*

27. Atratae.

Terminal spike staminate or sometimes with perigynia in the middle.
Basal sheaths not filamentose.
Culms few-leaved, strongly aphyllopodic.....91. *C. spectabilis.*
Culms many-leaved, clothed at base with dried-up leaves of previous year.....92. *C. raynoldsii.*
Basal sheaths filamentose.....93. *C. bifida.*

Terminal spike gynaecandrous; i.e., the terminal flowers pistillate.
Culms aphyllopodic, strongly purplish-red at base, the lower sheaths filamentose.....94. *C. buxbaumii.*

Culms phyllopodic.
Spikes 3 to 5, not oblong-cylindric; perigynia walls not papery; perigynia 2.5 to 4.5 mm. long, nerveless or obscurely nerved on face, dull green to brownish-black.
Perigynia not papillate-roughened.
Spikes contiguous, sessile or nearly so, forming a dense head; scales lanceolate, strongly exceeding perigynia; culms stiff, erect.....95. *C. helleri.*
Lower spike or spikes more or less peduncled, usually distant, erect or nodding; scales wider, shorter than or about equaling perigynia; culms more slender.
Scales with midvein largely obsolete; mature perigynia 3.5 to 4.5 mm. long, as wide or wider on either side than achene, the latter on stipe of nearly its own length; sheaths not purplish-tinged ventrally.....96. *C. epapillosa.*
Scales with prominent midvein; mature perigynia 3.5 mm. long, narrower on either side than achene, the latter much longer than its stipe; sheaths normally purplish-tinged ventrally.....97. *C. heteroneura.*
Perigynia papillate-roughened, especially on upper margins.....98. *C. albo-nigra.*
Spikes 6 to 10, oblong-cylindric; perigynia 5 mm. long, lightly 3-nerved, light green, the walls papery; scales much shorter than perigynia.....99. *C. mertensii.*

28. Acutae.

A. Flowering culms arising from the center of previous year's tuft of leaves and surrounded at base with dried-up leaves of previous year.

1. *Lower sheaths of flowering culms not breaking and becoming filamentose.*

Strongly stoloniferous, the culms arising one to few together, low; lowest bract normally much shorter than inflorescence; scales with obsolete or slender midvein.
Dried first year leaf-blades at base of fertile culms stiff, rigid and conspicuous, concealing the culms; fertile culm leaves all blade-bearing, the lower sheaths not purplish or hispidulous dorsally.....100. *C. scopulorum.*
Dried first year leaf-blades at base of fertile culms much desiccated, not stiff, rigid or conspicuous, and not concealing the culms; lowest fertile culm leaves not blade-bearing, the lower sheaths purplish and more or less strongly hispidulous dorsally.....101. *C. gymnoclada.*

Culms taller, less stiff, in larger clumps; lowest bract equaling or exceeding inflorescence; scales with slender midvein or broader light colored center.
Perigynia strongly nerved ventrally, the nerves raised.
Perigynia coriaceous, sessile or nearly so, the beak bidentate; strongly stoloniferous.....102. *C. nebraskensis.*
Perigynia membranaceous, more or less slenderly stipitate, the beak entire; cespitose.
Perigynia substipitate, orbicular, minutely papillate-roughened; scales deciduous.....103. *C. paucicostata.*
Peryginia strongly stipitate, ovate.
Perigynia yellowish-green, ribbed, papillate-roughened; scales deciduous.....104. *C. hindsii.*
Perigynia light green or in age glaucous green, nerved, very minutely granular; scales long persistent.....105. *C. kelloggii.*
Perigynia nerveless ventrally or with obscure impressed nerves.
Sheaths colored ventrally at mouth; lower pistillate spikes cernuous or subcernuous on long peduncles; scales in age whitened at tip.....106. *C. sitchensis.*
Sheaths not colored ventrally at mouth; lower pistillate spikes not nodding; scales not whitened at tip.....107. *C. aquatilis.*

2. *Lower or middle sheaths of flowering culms breaking and becoming filamentose.*

Beak of perigynium bidentate, hispidulous between teeth; scales strongly rough-awned.....108. *C. barbarae.*
Beak of perigynium entire or emarginate, not hispidulous between teeth; scales not rough-awned.

Lower culm sheaths strongly yellowish-brown tinged, sharply keeled; culms stout, the leaf-blades 6 to 12 mm. wide.....109. *C. schottii.*
Lower culm sheaths purplish-tinged, not sharply keeled; culms more slender, the leaf-blades narrower.....110. *C. senta.*

B. Some or all of the flowering culms arising laterally and not enveloped at base by previous year's tuft of leaves.

Culms very densely cespitose, forming dense stools; lowest sheaths strongly filamentose; lowest bract little developed, usually much exceeded by inflorescence.....111. *C. nudata.*
Culm much less densely cespitose, forming beds, conspicuously stoloniferous; lowest bract well-developed, from somewhat shorter than to exceeding inflorescence.
Perigynia orbicular or nearly so.....112. *C. eurycarpa.*
Perigynia oblanceolate.....113. *C. oxycarpa.*

29. Cryptocarpae.

Perigynia dull, straw-colored or light brown, slightly granular; lower sheaths of sterile shoots not filamentose.....114. *C. lyngbyei.*
Perigynia shining, brown, smooth; lower sheaths of sterile shoots strongly filamentose.....115. *C. obnupta.*

30. Trachychlaenae.

Represented by one species in our range.....116. *C. spissa.*

31. Hirtae.

Beak of perigynium obliquely cut, shallowly bidentate at maturity; foliage pubescent; staminate scales long-ciliate.....117. *C. yosemitana.*
Beak of perigynium deeply bidentate; staminate scales at most erose.
Foliage not pubescent; teeth of perigynium beak short.
Lowest bract strongly sheathing; fertile culms phyllopodic with many leaves, the sheaths not breaking and becoming filamentose.....118. *C. oregonensis.*
Lowest bract not sheathing; fertile culms aphyllopodic with few leaves, the sheaths breaking and becoming filamentose.....119. *C. lanuginosa.*
Sheaths and under surface of leaf-blades hairy; teeth of perigynium beak conspicuous.....120. *C. sheldonii.*

32. Extensae.

Represented by one species in our range.....121. *C. viridula.*

33. Physocarpae.

Perigynia ascending; lower sheaths more or less strongly filamentose; culms sharply triangular.
Perigynia 4 to 8 mm. long, abruptly contracted into beak.....122. *C. vesicaria.*
Perigynia 7 to 10 mm. long, tapering into beak.....123. *C. exsiccata.*
Perigynia spreading at maturity; lower sheaths not filamentose; culms bluntly triangular below spikes.....124. *C. rostrata.*

34. Pseudo-Cypereae.

Perigynia suborbicular in cross-section, more or less inflated; teeth of perigynium beak 0.5 to 1 mm. long.....125. *C. hystricina.*
Perigynia obtusely triangular, scarcely inflated, closely enveloping achene; teeth of perigynium beak 1.5 to 2 mm. long, recurved or spreading.....126. *C. comosa.*

Sect. 1. Inflatae Kük. Cespitose, the rootstocks elongate. Leaf-blades filiform. Spike solitary, ovoid, androgynous, densely flowered, bractless. Perigynia inflated, the walls very thin, slightly nerved, sessile, the smooth beak hyaline-tipped, obliquely cut, in age bidentulate. Achenes triangular. Stigmas 3.

1. **C. engelmannii** Bailey. Culms 5 to 20 cm. high; spike 10 to 15 mm. long, 6 to 10 mm. wide, the lower ¾ pistillate; scales acute to cuspidate, all except lower shorter than perigynia; perigynia 4.5 to 5 mm. long, 2.25 mm. wide.

Alpine peaks or meadows, Sierra Nevada in Tulare Co. North to Washington, east to Colorado.

Locs.—Kaweah Peaks, *Dudley* 2215; Chagoopa Mdws., *Dudley* 2272.
Ref.—Carex engelmannii Bailey, Proc. Am. Acad. 22:132 (1886), type coll. by *Engelmann*, probably near Colorado Sprs., Colo.

2. **C. breweri** Boott. (Fig. 28.) Culms 1 to 2.5 dm. high; spike 1 to 2 cm. long, 6 to 10 mm. wide, the upper third staminate; scales ovate, short-acuminate, narrower and shorter than perigynia; perigynia 5 mm. long, 3.5 mm. wide.

High alpine peaks of the Sierra Nevada from Mt. Whitney to Mt. Shasta. North to Washington.

Locs.—Mt. Whitney, *Jepson* 1085; head of San Joaquin River, *Brewer* 2831; Mt. Dana, *Brewer* 1863; Mt. Shasta, *Jepson*.
Refs.—Carex breweri Boott, Ill. Carex 4:142, pl. 455 (1867), type loc. Mt. Shasta, *Brewer* 1422; Mackenzie, Erythea 8:18, fig. 1 (1922); Kük. in Engler, Pflzr. 4[20]:96, fig. 20H-K (1909).

Fig. 28. CAREX BREWERI Boott. *a*, habit, × ⅔; *b*. scale, × 5; *c*, perigynium, × 5.

Fig. 29. *a*, CAREX CAPITATA L., habit, × 1; *b*, scale, × 8; *c*, perigynium, × 8. *d*, C. PANSA Bailey, habit, × ⅔; *e*, scale, × 5; *f*, perigynium, × 5.

Sect. 2. Athrochlaenae Holm. Cespitose or with creeping rootstocks. Leaf-blades narrow. Spike solitary, androgynous, bractless, narrow, densely many-flowered. Pistillate scales soon falling. Perigynia slenderly strongly stipitate, widely spreading or the lower reflexed, obscurely triangular, nerveless, membranaceous, long-beaked, the beak obliquely cut, becoming bidentulate. Achenes usually triangular, slightly apiculate. Stigmas 3 or occasionally 2.

3. **C. nigricans** C. A. Mey. Culms 5 to 30 cm. high, stiff, firm, smooth; leaves 4 to 9 to a fertile culm, the blades 1.5 to 3 mm. wide, flat, or channeled at base; spike 8 to 15 mm. long, 6 to 9 mm. wide, the upper half staminate, the lower with 10 to 25 perigynia; scales ovate, obtuse to acutish, dark-brown tinged with hyaline margins, shorter than perigynia; perigynia 4 mm. long, brownish, tapering into a smooth beak.

Arctic alpine in the Sierra Nevada, from Tulare Co. to Eldorado Co. North to Alaska, east to Colorado.

Locs.—Mt. Silliman, *Dudley* 1503; Minarets, *Congdon;* Vogelsang Pass, *Jepson* 3230; Lake Lucille, *Brewer* 1379.

Refs.—CAREX NIGRICANS C. A. Mey. Mem. Acad. St. Petersb. 1:211, pl. 7 (1831), type from Unalaschka; Mackenzie, Erythea 8:22, fig. 2 (1922). *C. pyrenaica* W. Boott in Bot. Cal. 2:228 (1880), not Wahl.

Sect. 3. Capitatae Christ. Cespitose. Leaf-blades filiform. Spike solitary, ovoid, androgynous, densely flowered, bractless. Perigynia plano-convex, sharp-edged, not inflated, essentially nerveless, sessile, the walls thinnish, the smooth terete beak conspicuously hyaline-tipped, in age bidentulate. Achenes lenticular, apiculate. Stigmas 2.

4. **C. capitata** L. (Fig. 29a-c.) Culms 1 to 3.5 dm. high, roughish above, the basal sheaths purplish; spike 4 to 10 mm. long; scales ovate-orbicular, obtuse, shorter and narrower than perigynia, chestnut-brown with broad hyaline margins; perigynia 2 to 3 mm. long, pale green, smooth, rounded at base, the abrupt beak slender, dark-colored, less than 1 mm. long.

Sierra Nevada in Fresno and Tulare cos., 6500 to 8000 ft. North to Alaska, east to New Hampshire, south to Mexico.

Locs.—Mt. Goddard, *Hall & Chandler* 673; Kaweah Mdw., Tulare Co., *Dudley* 2216.

Refs.—CAREX CAPITATA L. Syst. Nat. ed. 10, 1261 (1759), type from n. Eur.; Kük. in Engler, Pflzr. 4^{20}:70, fig. 15K-N (1909); Mackenzie, Erythea 8:22, fig. 3 (1922).

Sect. 4. Foetidae Tuckerm. Leaf-blades narrow. Spikes few to several, androgynous, in a dense subglobose or ovoid head. Perigynia spreading, plano-convex, membraneous, usually obsoletely nerved, looscly enveloping the achene, rounded at base, stipitate, the beak obliquely cut, at times bidentulate. Achenes lenticular. Stigmas 2.

5. **C. vernacula** Bailey. Culms 0.5 to 2 dm. high, smooth; leaf-blades 2 to 4 mm. wide, stiff; head about 1 cm. in diameter, the staminate flowers inconspicuous; scales ovate, brown, sharp-pointed, rather wider and from shorter to longer than perigynia; perigynia ovoid, 3.5 to 4.5 mm. long, not margined, tapering into the smooth beak ⅓ length of body.

Alpine slopes, Sierra Nevada from Tulare Co. to Modoc Co. North to Washington, east to Colorado.

Locs.—Mt. Whitney, *Bailey* 2067; Mt. Goddard, *Hall & Chandler* 694; Stanislaus Peak, *A. L. Grant* 534; Big Trees, Calaveras Co., *Hillebrand* 2304; Butte Co., *E. M. Austin* 1159; Modoc Co., *Manning* 433.

Refs.—CAREX VERNACULA Bailey, Bull. Torr. Club 20:417 (1893), type from w. U. S.; Mackenzie, Erythea 8:23, fig. 4 (1922). *C. foetida* W. Boott in Bot. Cal. 2:232 (1880), not All. *C. incurva* Bailey, Contrib. U. S. Nat. Herb. 4:214 (1893), not Lightf.

Sect. 5. Divisae Christ. Culms arising singly or in small clumps at intervals, mostly stiff, dark-tinged at base, aphyllopodic. Leaf-blades narrow. Spikes few to many, ovoid or oblong, androgynous or dioecious, more or less closely aggregated into an oblong or oblong-ovoid head. Heads in some species dioecious or nearly so. Lower one to several bracts developed, short-prolonged, the others bract-like. Perigynia appressed-ascending, plano-convex, smooth, often shining, coriaceous, more or less nerved on outer surface, sharp-edged but not wing-margined, rounded and spongy at base, the obliquely cut beak in age bidentulate. Achenes lenticular, closely enveloped. Stigmas 2.

6. **C. douglasii** Boott. Culms 6 to 30 cm. high; leaf-blades 1 to 2.5 mm. wide, involute above and flat or channeled at base; heads dioecious or nearly so; staminate spikes linear-elliptic, 8 to 15 mm. long, 2.5 to 4 mm. wide, the scales

straw-colored or brownish, pointed; pistillate spikes wider, the scales ovate to lanceolate, concealing the perigynia, yellowish-brown, with broad hyaline margins and lighter center; perigynia lanceolate, 4 mm. long, lightly nerved ventrally, strongly nerved dorsally, tapering into a strongly serrulate beak nearly 2 mm. long, its apex hyaline; styles elongate.

Dry or alkaline soil along or east of the Sierra Nevada from Modoc Co. to Inyo Co.; south to Mt. Pinos. North to British Columbia, east to Nebraska.

Locs.—Mt. Pinos, Ventura Co., *Hall* 6554; North Fork Crooked Creek, White Mts., *Jepson* 7271; Mono Valley, *Brewer* 1813; Yosemite, *Bolander* 6199; Donner Lake, *Davy* 3233 B; Warner Mts., *Griffiths & Hunter* 459.

Ref.—Carex douglasii Boott in Hook. Fl. Bor. Am. 2:213, pl. 214 (1840), type loc. Northwest Coast, *Douglas*.

7. **C. simulata** Mackenzie. Culms 3 to 5 dm. high; leaf-blades 2 to 4 mm. wide, flat; head linear-oblong or oblong-ovoid, 12 to 25 mm. long, the 5 to 15 spikes pistillate, staminate or androgynous; scales concealing the perigynia, cuspidate, brown with hyaline margins; perigynia broadly ovate, 1.8 to 2.25 mm. long, nerveless ventrally, serrulate above, abruptly beaked, the beak 0.25 mm. long.

Wet soil, west slope or mostly east slope of the Sierra Nevada from Fresno Co. to Sierra Co. and northward. North to Washington, east to Colorado.

Locs.—Kings River Cañon, *Dudley* 3193; Rowan Mdw., Fresno Co., *Dudley;* Sonora trail, *Brewer* 1865; Sierraville, *Dudley;* Modoc Co., *Manning* 952 (in part); Sisson, *Dudley*.

Refs.—Carex simulata Mackenzie, Bull. Torr. Club 34:604 (1907), type loc. Chug Creek, Albany Co., Wyo., *A. Nelson* 7316. *C. gayana* Boott, Ill. Car. 3:126, pl. 411 (1862), not Desv.

8. **C. pansa** Bailey. (Fig. 29d-f.) Culms 1.5 to 3 dm. high; leaf-blades 1 to 3 mm. wide; head 1.5 to 2.5 cm. long, the spikes lance-ovoid, 7 to 10 mm. long, the several to many perigynia appressed; scales with conspicuous white-hyaline margins, concealing perigynia; perigynia oblong-lanceolate, nerveless ventrally, tapering at apex, the beak 1 mm. long, serrulate.

Drifting sands along the seacoast from Monterey Co. to Del Norte Co. North to Washington.

Locs.—Asilomar, Monterey, *Parish* 11475; San Francisco, *Olsson-Seffer;* Eureka, *Tracy* 3258; Crescent City, *Dudley*.

Refs.—Carex pansa Bailey, Bot. Gaz. 13:82 (1880), based upon Clatsop, Ore., *Henderson*, and Ilwaco, Wash., *Henderson;* Mackenzie, Erythea 8:25, fig. 5 (1922).

9. **C. praegracilis** W. Boott. Culms 2 to 7.5 dm. high; leaf-blades 1.5 to 3 mm. wide, flattened or canaliculate; head 1 to 5 cm. long, the 5 to 15 spikes densely aggregated, androgynous, with 4 to 10 perigynia; scales ovate-lanceolate, acute to cuspidate, nearly concealing the perigynia; perigynia nerved on the outer, nearly nerveless on the inner face.

Meadows, widely distributed except on the higher mountains. North to Alaska, east to Iowa.

Locs.—San Jacinto Mts., *Hall* 2664; San Bernardino, *Parish* 4651; San Antonio Mts., *Abrams* 2679; San Pedro, *Wood* 262; Mt. Pinos, *Hall* 6375; Santa Barbara, *Bingham* 491; Pacific Grove, *Heller* 6634; Hepsedam Peak, San Benito Co., *Dudley;* San Francisco, *M. E. Jones* 3268; Sacramento, *Bolander* 4502; Giant Forest, *Dudley* 2987; Tallac, *Dudley;* Mill Creek, Mt. Lassen, *Hall & Babcock* 4308 in part; Hanaupah Cañon, Panamint Mts., *Jepson* 7097; White Mts., *Shockley* 632.

Refs.—Carex praegracilis W. Boott, Bot. Gaz. 9:87 (1884), type loc. San Diego, *Scott*. *C. marcida* Boott in Hook. Fl. Bor. Am. 2:212, pl. 213 (1840), type from Columbia River (not J. F. Gmel. 1791). *C. douglasii* Boott var. *brunnea* Olney, Bot. King 5:363 (1871), type from Cal., *Coulter* 805. *C. usta* Bailey, Mem. Torr. Club 1:20 (1889), based on *C. douglasii* var. *brunnea*. *C. hookeriana* Parish, Bull. S. Cal. Acad. 5:26 (1906), not Dew. *C. siccata* Parish, l.c. 50, not Dew.

Sect. 6. Muhlenbergianae Tuckerm. Densely cespitose. Culms not flattened. Spikes few, androgynous or pistillate but never gynaecandrous, rarely compound. Perigynia plano-convex, appressed to reflexed, often strongly spongy at base, narrowly sharp-margined, conspicuously beaked, the beak sharply bidentate. Achenes lenticular. Stigmas 2.

10. **C. hoodii** Boott. (Fig. 30a-c.) Culms 3 to 8 dm. high; leaf-blades 1.5 to 3.5 mm. wide; head 1 to 2 cm. long, the spikes with 5 to 10 ascending perigynia; scales ovate, sharp-pointed, chestnut brown with lighter keel and broad hyaline margins; perigynia lance-ovate, 4 to 5 mm. long, green-margined above, the beak ⅓ length of body.

Mountain meadows and slopes, Sierra Nevada from Tulare Co. to Shasta Co. North to British Columbia, east to Colorado.

Locs.—Soda Sprs., Tulare Co., *Dudley* 2343; Minarets, *Congdon;* Lake Merced, Yosemite Park, *Jepson* 4409, 4428; Kennedy Lake, *A. L. Grant* 199; Tallac, *Brainerd;* Morgan, Tehama Co., *Hall & Babcock* 4346.

Refs.—CAREX HOODII Boott in Hook, Fl. Bor. Am. 2:211, pl. 211 (1840), type loc. Columbia River, *Douglas;* Mackenzie, Erythea 8:26, fig. 6 (1922). *C. hoodii* Boott var. *nervosa* Bailey, Mem. Torr. Club 1:14 (1889), type from Cal., *Kellogg & Harford* 1069.

11. **C. tumulicola** Mackenzie. Culms 2 to 8 dm. high; leaf-blades 1.5 to 2.5 mm. wide; head 2 to 5 cm. long, slender, the upper spikes aggregated, the lower separate, with 10 or fewer appressed perigynia; lower bracts long-cuspidate; scales largely concealing perigynia, brownish straw-color with hyaline margin and green midrib, acuminate to cuspidate; perigynia lanceolate, 4 to 5 mm. long, the serrulate beak ⅓ to ½ length of body.

Dry soil in the coastal counties from Monterey Co. to Humboldt Co., and in the Sierra Nevada from Tuolumne Co. to Calaveras Co. North to Washington.

Locs.—Coast Ranges: Monterey, *Davy* 7268; Santa Cruz Mts., *Bolander* 150; Berkeley Hills, *Davy* 4244; St. Helena, *Jepson* 6242; Ft. Bragg, *Bolander* 4765; Eureka, *Tracy* 4642. Sierra Nevada: Relief Dam, Tuolumne Co., *A. L. Grant* 370; Calaveras Big Trees, *A. L. Grant* 4c.

Refs.—CAREX TUMULICOLA Mackenzie, Bull. Torr. Club 34:154 (1907), type loc. Lake Temescal, Alameda Co., *Bioletti;* Erythea 8:27, fig. 7 (1922). *C. muricata* L. var. *gracilis* W. Boott in Bot. Cal. 2:232 (1880), not F. Boott. *C. hookeriana* Kük. in Engler, Pflzr. 4[20]:161 (1909) as to Cal. plant, not Dew.

Sect. 7. Multiflorae Kunth. Densely cespitose. Culms sharply triangular. Opaque part of sheaths usually transversely rugulose, red-dotted. Spikes numerous, small, androgynous or pistillate, but never gynaecandrous, the lower more or less compound. Bracts frequently conspicuous. Perigynia plano-convex, appressed-ascending or spreading, not thick-walled, somewhat spongy at base, short-stipitate, sharp-margined, more or less nerved, conspicuously rough-beaked, the beak bidentate. Achenes lenticular. Stigmas 2.

12. **C. stenoptera** Mackenzie. Culms 2.5 to 4 dm. high; leaf-blades 2 to 3 mm. wide, channeled, the sheaths tight; head decompound, 2 to 5.5 cm. long, with spikes 5 to 8 mm. long, 4 to 6 mm. wide; bracts inconspicuous; scales ovate-lanceolate, obtusish to short-cuspidate, brownish, exceeding perigynia; perigynia 3 to 3.5 mm. long, nerved dorsally, nerveless ventrally or nearly so, round-tapering at base, tapering into a serrulate beak about ½ length of body.

San Antonio Mts., Southern California.

Ref.—CAREX STENOPTERA Mackenzie, Erythea 8:28 (1922), type loc. Ice House Cañon, San Antonio Mts., *Johnston* 1505.

13. **C. alma** Bailey. (Fig. 30d-f.) Culms 3 to 12 dm. high, strict, rough on angles; leaf-blades 3 to 6 mm. wide; head 2.5 to 20 cm. long, decompound, the clusters closely aggregated to strongly separate; scales ovate, short-pointed to obtusish, straw-colored or brownish; perigynia 3.5 to 4 mm. long, smooth, shining, narrowly green-margined, serrulate from middle, lightly few-nerved on both sides, tapering into the serrulate beak.

Along streams, Monterey and Tulare cos. to Southern California. East to southern Nevada and Arizona.

Locs.—Coast Ranges: Tassajara Hot Sprs., Monterey Co., *Elmer* 3137; Mt. Pinos, *Hall* 6429. Southern California: Pasadena, *McClatchie;* San Antonio Mts., *Johnston* 1425; Mt. San Gorgonio, *Geo. B. Grant* 6399; Palm Sprs., Mt. San Jacinto, *Parish* 4144; New York Mts., *Parish* 10225. Sierra Nevada: Nelson Soda Sprs., Tulare Co., *Dudley* 877; Bisses sta., Kern Co., *Dudley* 405.

Refs.—CAREX ALMA Bailey, Mem. Torr. Club 1:50 (1889), type loc. San Bernardino Co., *Parry & Lemmon* 396; Mackenzie, Erythea 8:28, fig. 8 (1922). *C. vitrea* Holm, Am. Jour.

Sci. ser. 4, 17:302, figs. 5-7 (1904), type from Palm Sprs., Mt. San Jacinto, *Parish* 4144. *C. chrysoleuca* Parish, Bull. S. Cal. Acad. 5:22 (1906), not C. chrysoleuca Holm.

14. **C. densa** Bailey. (Fig. 30g-i.) Culms 3 to 6 dm. high, smooth or roughened above, from exceeding to shorter than the leaves; leaf-blades 3 to 6 mm. wide, the sheaths septate dorsally, and thin, hyaline and more or less cross-rugulose ventrally, prolonged and convex at the mouth; head 2 to 5 em. long; braets inconspicuous, exeept 1 or 2 lower ones; perigynia 3.5 to 4.5 mm. long, strongly convex dorsally, ovate or ovate-lanceolate from a round-tapering base, narrowly green-margined, serrulate above middle, the beak more than ½ length of body.

Dry soil, cismontane: Sierra Nevada from Mariposa Co. northward; Marysville Buttes; Coast Ranges from Santa Clara Co. northward. North to Oregon.

Locs.—Sierra Nevada: Snow Creek, Mariposa Co., *Congdon;* Pine Grove, Amador Co., *Hansen* 1233. Coast Ranges: Santa Cruz Mts., *J. R. Bush;* Crystal Sprs., San Mateo Co., *Abrams* 2444; Oakland, *Bolander* 6204; Calistoga, *Tracy* 1637; Sherwood Valley, *Davy* 5150; Buck Mt., Humboldt Co., *Tracy* 4231; Weaverville, *Yates* 296; Sisson, *Jepson* 51a.

Refs.—Carex densa Bailey, Mem. Torr. Club 1:50 (1889), type loc. Mark West Creek, Sonoma Co., *Bigelow;* Mackenzie, Erythea 8:29, fig. 9 (1922). *C. brongniartii* Kunth, var. *densa* Bailey, Proc. Am. Acad. 22:137 (1886). *C. brongniartii* Boott, Ill. Car. 3:124, pl. 402 (1862), in part, not Kunth. *C. chrysoleuca* Holm, Am. Jour. Sci. ser. 4, 17:302 (1904), type from Mariposa, *Congdon. C. disticha* W. Boott in Bot. Cal. 2:230 (1880), not Huds. *C. glomerata* W. Boott, l.c. 232, not Thunb. *C. paniculata* W. Boott, l.c. 232 in part, not L.

15. **C. vicaria** Bailey. Culms 3 to 6 dm. high, exeeeding the leaves, rough above; leaf-blades 3 to 4.5 mm. wide, the sheaths tight, not eonspieuously septate dorsally, thin-hyaline and more or less eross-rugulose ventrally, short-prolonged and convex at mouth; head 1.5 to 3 em. long; braets ineonspieuous exeept 1 or 2 lower ones; perigynia 3 to 3.5 mm. long, ovate from a rounded base, green-margined, serrulate above middle, the beak ½ length of body.

Marshes, Mendoeino Co. (Ronnd Valley, Chesnut 108). North to Washington.

Refs.—Carex vicaria Bailey, Mem. Torr. Club 1:49 (1889), type from Ore., *E. Hall. C. brongniartii* Bailey, Proc. Am. Acad. 22:137 (1886), not Kunth.

16. **C. breviligulata** Maekenzie. Culms 3 to 6 dm. high, exeeeding leaves, rough above; leaf-blades 3 to 4.5 mm. wide, the sheaths tight, not eonspieuously septate dorsally, thin-hyaline and more or less eross-rugulose ventrally, truncate at mouth; head 1.5 to 3.5 em. long; braets usually not conspieuous; perigynia 3.25 to 3.75 mm. long, ovate from a round-tapering base, green-margined, serrulate from middle, the beak ½ length of body.

Marshes and swales: North Coast Ranges; Sierra Nevada. North to Oregon.

Locs.—Santa Rosa, *Wooton;* Round Valley, ne. Mendocino Co., *Chesnut* 285; Susanville, *Jones;* North Fork, Fresno Co., *Griffiths* 4479.

Refs.—Carex breviligulata Mackenzie, Erythea 8:92 (1922). *C. vicaria* var. *costata* Bailey, Mem. Torr. Club 1:49 (1889), type from Grant's Pass, Ore., *Henderson* 1477.

17. **C. dudleyi** Mackenzie. Culms 3 to 7 dm. high, rough above, exeeeding leaves; leaf-blades 4 to 7 mm. wide, the sheaths tight, ineonspieuously septate dorsally, white-hyaline and searcely eross-rugulose ventrally, the ligule as long as wide; head 2 to 3.5 em. long; braets setaeeous, the lower conspieuous; perigynia narrowly ovate from a rounded base, brownish-yellow with green margin, nerved ventrally, the beak serrulate.

Coast Ranges from Monterey Co. to Lake Co. Apparently local.

Locs.—Glen Ellen, Sonoma Co., *Bioletti* 19; Scott Valley, Lake Co., *Blankinship.*

Ref.—Carex dudleyi Mackenzie, Erythea 8:30 (1922), type loc. Tassajara Hot Sprs., Monterey Co., *Elmer* 2132.

Sect. 8. Paniculatae Kunth. Densely or loosely cespitose. Culms not flattened. Opaque part of leaf-sheaths strongly red-dotted. Spikes numerous, small, androgynous or pistillate, but never gynaecandrous, the lower compound or decompound. Bracts usually inconspicuous. Perigynia thick, high convex on the dorsal and often somewhat convex on the ventral face, ascending or spreading, coriaceous, spongy at base, stipitate, narrowly margined, more or less nerved, conspicuously rough-beaked, the beak bidentate. Achenes lenticular. Stigmas 2.

Fig. 30. *a*, CAREX HCODII Boott, inflorescence, × 1; *b*, scale, × 7; *c*, perigynium, × 7. *d*, C. ALMA Bailey, inflorescence, × 1; *e*, scale, × 8; *f*, perigynium, × 8. *g*, C. DENSA Bailey, inflorescence, × 1; *h*, scale, × 6; *i*, perigynium, × 6. *j*, C. CUSICKII Mackenzie, inflorescence, × 1; *k*, scale, × 8; *l*, perigynium, × 8.

Fig. 31. *a*, CAREX NERVINA Bailey, inflorescence, × 1; *b*, scale, × 6; *c*, perigynium, × 6. *d*, C. STIPATA Muhl., inflorescence, × 1; *e*, scale, × 6; *f*, perigynium, × 6. *g*, C. BOLANDERI Olney, inflorescence, × 1; *h*, scale, × 7; *i*, perigynium, × 7. *j*, C. FETA Bailey, inflorescence, × 1; *k*, scale, × 8; *l*, perigynium, × 8.

18. **C. diandra** Schrank. Culms 3 to 7 dm. high, slender; leaf-blades canaliculate at base; sheaths not copper-colored at mouth; head 2.5 to 5 cm. long; scales acute, brownish; perigynia round-truncate at base, the beak serrulate.

Wet meadows, very local: San Bernardino Valley and Oriole Lake, Tulare Co. North to Alaska, east to Newfoundland.

Refs.—CAREX DIANDRA Schrank, Acta Acad. Mogunt. 49 (1782), type from s. Bavaria, Germany; Kük. in Engler, Pflzr. 4[20]:175, fig. 28A-D (1909). *C. bernardina* Parish, Bull. S. Cal. Acad. 5:24, pl. 21 (1906), type loc. San Bernardino Valley, *Parish* 4600.

19. **C. cusickii** Mackenzie. (Fig. 30j-l.) Culms stout, 7 to 12 dm. high; leaf-blades flat with slightly revolute margins, the sheaths copper-tinged at mouth; head 4 to 8 cm. long; scales chestnut-tinged; perigynia truncate at base, the beak setulose-serrulate.

Wet meadows near the coast from San Francisco to Del Norte Co. Rare. North to British Columbia, east to Montana.

Locs.—San Francisco, *Bolander* 1568 (in part); Crescent City, *Dudley*.

Refs.—CAREX CUSICKII Mackenzie in Piper & Beattie, Fl. Nw. Coast 72 (1915); Erythea 8:31, fig. 10 (1922). *C. teretiuscula* Good. var. *ampla* Bailey, Mem. Torr. Club 1:53 (1889), type from Burnt River, Ore., *Cusick* 1331. *C. paniculata* W. Boott in Bot. Cal. 2:232 (1880) in part, not L.

Sect. 9. Stenorhynchae Holm. Densely cespitose or with more or less elongated rootstocks. Culms triangular or somewhat flattened. Opaque part of leaf-sheaths usually transversely rugulose or red-dotted. Spikes few to many, androgynous or pistillate, but never gynaecandrous, the lower simple to compound. Bracts little developed. Perigynia plano-convex, yellowish or yellowish-brown, appressed-ascending to spreading, not thick-walled but strongly spongy at base, stipitate, strongly many-nerved, the margins nearly obsolete on the lower half, conspicuously beaked, the beak bidentate. Achenes lenticular. Stigmas 2.

20. **C. jonesii** Bailey. Culms 2 to 6 dm. high, slender; leaf-blades 1 to 2 mm. wide; opaque part of sheath white, not cross-rugulose, truncate at mouth; head 8 to 18 mm. long, the larger spikes with 5 to 10 ascending perigynia; scales exceeding or shorter than the perigynia, ovate, dark brown; perigynia ovate-lanceolate, 3 to 4 mm. long, 1.5 mm. wide, the beak very slightly serrulate, 1/3 length of body.

High mountains, 5000 to 7200 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Siskiyou Co. North to Washington, east to Montana.

Locs.—Bluff Lake, San Bernardino Mts., *Parish* 3273; Kaweah Mdw., *Dudley* 2207; Kings River Cañon, *Dudley* 3191; Peregoy Mdw., Yosemite Park, *Jepson* 4335; Sonora Peak, *A. L. Grant* 412; Truckee River, *Davy;* Mt. Shasta, *Goldsmith* 37.

Refs.—CAREX JONESII Bailey, Mem. Torr. Club 1:16 (1889), type loc. Soda Sprs., Nevada Co., *Jones;* Mackenzie, Erythea 8:32, fig. 11 (1922). *C. illota* Parish, Bull. S. Cal. Acad. 5:52 (1906), not Bailey. *C. bonplandii* Kunth. var. *angustifolia* W. Boott in Bot. Cal. 2:233 (1880) as to spms. with androgynous spikes, not F. Boott.

21. **C. nervina** Bailey. (Fig. 31a-c.) Culms 3 to 9 dm. high, strongly aphyllopodic, slightly flattened in drying; opaque part of sheaths olive-tinged, truncate or concave at the mouth; head 1.5 to 3 cm. long, the larger with 6 to 12 ascending perigynia, the staminate flowers rarely conspicuous; scales ovate, brownish; perigynia ovate-lanceolate, 3.5 to 4 mm. long, the beak smoothish, 1 mm. long, the teeth erect.

High mountains, 4000 to 7000 ft., Sierra Nevada from Tulare Co. to Siskiyou Co. North to southern Oregon.

Locs.—Giant Forest, *Dudley* 2998; Lake Tenaya, *Congdon;* Emigrant Gap, *M. E. Jones* 3533; Craggy Peak, Siskiyou Co., *Dudley*.

Refs.—CAREX NERVINA Bailey, Bot. Gaz. 10:203, pl. 3, figs. 6–8 (1885), type loc. Summit Camp, Placer Co., *Kellogg;* Mackenzie, Erythea 8:33, fig. 12 (1922); not C. nervina Parish, Bull. S. Cal. Acad. 5:26 (1906).

22. **C. stipata** Muhl. (Fig. 31d-f.) Culms 3 to 12 dm. high, rather weak, sharply triangular, strongly serrulate above; leaf-blades 4 to 8 mm. wide, flat, flaccid, the sheaths strongly septate dorsally, the opaque part thin, quickly broken, cross-rugulose; head 3 to 10 cm. long, yellowish-brown; scales ovate-

triangular, light-brownish, about length of body of perigynium; perigynia laneeolate, 4 to 5 mm. long, the serrulate beak longer than or nearly equaling the body.

Swamps and wet meadows: Coast Ranges from Sonoma Co. to Siskiyou Co., thenee southerly in the Sierra Nevada to Sierra Co. North to Alaska, east to Newfoundland.

Locs.—North Coast Ranges: Santa Rosa, *Heller;* Weaverville, *Yates* 295; Sisson, *Jepson* 56a. Sierra Nevada: Sierra Valley, *Lemmon* 479; Quiney, *Jepson* 4148.

Refs.—Carex stipata Muhl. Willd. Sp. Pl. 4:233 (1805), type from Penn., *Muhlenberg;* Kük. in Engler, Pflzr. 4[20]:172, fig. 27H-L (1909); Mackenzie, Erythea 8:33, fig. 13 (1922).

Sect. 10. Stellulatae Kunth. Densely cespitose. Culms triangular. Sheaths not red-dotted or cross-rugulose. Spikes 2 to 10, or by reduction 1, gynaecandrous, pistillate or in a few species staminate, not compound. Bracts inconspicuous. Perigynia plano-convex, yellow-brown or brown, spreading or reflexed at maturity, the body orbicular, ovate or broadly oval, strongly spongy at base, sharp-edged nearly if not entirely to the rounded or truncate base, not punctieulate, nerved on the outer, nerved or nerveless on the inner surface, the beak bidentate or obliquely cut. Achenes lenticular. Stigmas 2.

23. **C. laeviculmis** Meinsh. Culms 3 to 7 dm. high, weak; leaf-blades 1 to 2 mm. wide, light green, flat, soft; spikes 3 to 8, widely separate or upper approximate, suborbicular, 3 to 10 mm. long, with 3 to 10 perigynia; uppermost spike long-clavate at base; seales ovate, about length of body of perigynium, with conspicuous green midvein; perigynia green or brownish-green, oblong-ovoid, plano- or coneave-eonvex, 2.5 to 4 mm. long, 1.5 mm. wide, thin-walled, lightly nerved ventrally, the beak ⅓ length of body.

Wet shaded plaees: Humboldt Co.; northern Sierra Nevada from Eldorado Co. to Butte Co. Northerly to Alaska and Idaho.

Locs.—Bald Mt., Humboldt Co., *Tracy* 4524; Stirling, Butte Co., *Heller* 10819; Strawberry Creek, Eldorado Co., *Brainerd* 170.

Refs.—Carex laeviculmis Meinsh. Bot. Centralb. 55:195 (1893), type from Kamtschatka; Kük. in Engler, Pflzr. 4[20]:232, fig. 37E-F (1909); Mackenzie, Erythea 8:34, fig. 14 (1922).

24. **C. interior** Bailey. Culms 1.5 to 5 dm. high, slender and wiry; leaf-blades 1 to 3 mm. wide, flat or somewhat canalieulate; head 1 to 2 em. long, the 3 or 4 spikes approximate, the lateral pistillate, suborbicular, 4 mm. long, with 3 to 10 widely spreading perigynia, the upper long-tapering and staminate at base; scales ovate-orbieular, brownish, hyaline-margined all around, the center lighter-colored, the midvein not sharply defined; perigynia oblong-ovoid, straw-color or light-brownish, plump, 2.5 to 3 mm. long, sparingly serrulate on the upper margins, abruptly beaked, the beak with very short teeth.

Boggy meadows, northern Sierra Nevada from Plumas Co. to Siskiyou Co. North to British Columbia, east to Newfonndland, and south to Mexico.

Locs.—Prattville, Plumas Co., *Jones;* Mt. Shasta, *A. Wood* 999.

Ref.—Carex interior Bailey, Bull. Torr. Club 20:426 (1893), type loc. Penn Yan, New York, *Sartwell.*

25. **C. ormantha** Maekenzie. Culms 1.5 to 4 dm. high, slender but rather stiff; leaf-blades slightly canalieulate, 1.5 to 2 mm. wide; head 2 to 6 em. long; spikes 3 or 4, the lateral suborbieular, 6 to 8 mm. wide, with 2 to 12 widely radiating perigynia; perigynia rounded at base, tapering into the bidentate beak more than ½ length of body, the teeth short.

Boggy places in the mountains, mostly 4000 to 6000 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Tehama Co. Also in Oregon.

Locs.—San Bernardino Mts., *Parish* 3274; Kaweah River, *Dudley* 1448; Crescent Lake, Mariposa Co., *Congdon;* Yosemite, *Hall & Babcock* 3412; Calaveras Big Trees, *Bolander & Hillebrand* 2324; Mineral, Tehama Co., *Eggleston* 7209.

Refs.—Carex ormantha Mackenzie, Erythea 8:35 (1922). *C. echinata* Murr. var. *ormantha* Fern. Proc. Am. Acad. 37:483, pl. 4, f. 89 (1902), type loc. Strawberry Creek, Eldorado Co., *Brainerd* 160, excluding Conn. and R. I. spms. *C. stellulata* Good. var. *ormantha* Fern. Rhod. 4:222 (1902).

26. **C. phyllomanica** W. Boott. Culms 2.5 to 6 dm. high, smooth or nearly so; leaf-blades flat, 1.75 to 2.75 mm. wide; head 1.5 to 3.5 em. long; spikes 3 or 4, the lateral suborbicular, 7 mm. wide with 8 to 15 widely spreading perigynia;

perigynia round-truncate at base, tapering into a beak scarcely ½ length of body, the teeth short.

Swampy places near the coast from Mendocino Co. to Del Norte Co. North to Alaska.

Locs.—Mendocino City, *Bolander* 4746; Patricks Point, Humboldt Co., *Tracy* 4364; Del Norte Co., *Davy*.

Refs.—CAREX PHYLLOMANICA W. Boott in Bot. Cal. 2:233 (1880), type loc. Mendocino City, *Bolander* 4746. *C. sterilis* W. Boott, l.c. 236, not Willd. *C. vallicola* W. Boott, l.c. 235, not Dew. *C. echinata* W. Boott, l.c. 237, not Murr.

27. **C. angustior** Mackenzie. Culms very slender but striet, 1 to 6 dm. high, sómewhat roughened above; leaf-blades 1 to 2 mm. wide, flat or eanaliculate; spikes 2 to 5, approximate, 4 to 6 mm. long, with 3 to 15 perigynia, the terminal long-clavate, the lateral rounded at base; scales as long as body of perigynia, ovate; perigynia 2.5 to 3.5 mm. long, yellowish-brown, impressed-nerved ventrally, tapering into a bidentate beak more than ½ length of body.

Boggy places, rare: Eldorado Co.; Humboldt Co. North to Washington, east to Newfoundland.

Locs.—Fallen Leaf Lake, *Abrams* 4796; Bald Mt., Humboldt Co., *Tracy* 4532.

Refs.—CAREX ANGUSTIOR Mackenzie in Rydb. Fl. Rocky Mts. 124 (1917). *C. stellulata* Good. var. *angustata* Carey, Gray's Man. 544 (1848), type loc. Fairfield, N. Y.

28. **C. illota** Bailey. Culms 1 to 3.5 dm. high, slender but striet; leaf-blades 1.5 to 3 mm. wide; scales broadly ovate, obtuse, brownish-black; perigynia ovate, 3 mm. long, obseurely nerved, brownish-black, the beak ⅓ length of body, smooth or nearly so, emarginate.

High montane, Sierra Nevada from Tulare Co. to Eldorado Co. North to Washington, east to Colorado.

Locs.—Camp Alta, Tulare Co., *Dudley* 992; Kings River, *Dudley* 3299; Soda Sprs. of the San Joaquin, *Congdon;* Yosemite, *Congdon* 88; Devils Basin and Lake Audrain, Eldorado Co., *Brainerd*.

Refs.—CAREX ILLOTA Bailey, Mem. Torr. Club 1:15 (1889), not Parish, Bull. S. Cal. Acad. 5:52 (1906). *C. bonplandii* Kunth var. *minor* Boott, Proc. Acad. Phila. 77 (1863), type from Col., *Hall & Harbour*. *C. bonplandii* Kunth var. *angustifolia* W. Boott in Bot. Cal. 2:233 (1880), mostly, not F. Boott.

Sect. 11. Deweyanae Tuckerm. Densely cespitose. Culms triangular. Sheaths not red-dotted or cross-rugulose. Spikes 3 to 8, gynaecandrous, pistillate or rarely staminate, simple. Lower one or two bracts often conspicuous. Perigynia plano-convex, light or yellowish-green, appressed, the body ovate or linear-oblong, strongly spongy at base, only upper half sharp-edged, round-tapering at base, nerved on the outer face, nerved or nerveless on the inner face, the beak bidentulate to deeply bidentate. Achenes lenticular. Stigmas 2.

29. **C. leptopoda** Mackenzie. Culms erect, 2 to 8 dm. high, roughened beneath head; leaf-blades 2.5 to 5 mm. wide; spikes ovoid-oblong or linear-oblong, with 6 to 18 perigynia; scales not reddish-brown tinged, mostly euspidate, shorter than the bodies of the ovate-lanceolate perigynia.

Damp woods: Sierra Nevada from Tulare Co. to Shasta Co., 4000 to 8000 ft.; Coast Ranges from Santa Cruz Co. to Trinity Co., 50 to 3000 ft. North to British Columbia, east to Idaho.

Locs.—Sierra Nevada: Mineral King, *Hall & Babcock* 5373; Pine Ridge, Fresno Co., *Hall & Chandler* 238 (in part); Yosemite, *Bolander* 6201; San Antonio Creek, Calaveras Co., *Dudley;* McCloud, *Goldsmith* 8. Coast Ranges: Redwood Park, Santa Cruz Co., *Dudley;* Oakland Hills, *Bolander;* Sherwood Valley, *Dudley;* Eureka, *Tracy* 921; Coffee Creek, Trinity Co., *Goldsmith* 18.

Refs.—CAREX LEPTOPODA Mackenzie, Rydb. Fl. Rocky Mts. 124 (1917), type loc. Elk Rock, near Oswego, Clackamas Co., Ore., *Heller* 10052. *C. deweyana* W. Boott in Bot. Cal. 2:236 (1880) in part, not Schw.

30. **C. bolanderi** Olney. (Fig. 31g-i.) Culms 1.5 to 9 dm. high, little roughened beneath head; leaf-blades 2.5 to 5 mm. wide; spikes linear-oblong or linear, with 8 to 30 perigynia; scales usually reddish-brown tinged, mostly aeute or mueronate, concealing the bodies of the lanceolate perigynia.

Widely distributed in the mountain ranges, mostly at lower altitudes, 100 to 2000 (or 6000) ft.: San Bernardino Mts.; Coast Ranges; Sierra Nevada. North to British Columbia, east to New Mexico and Montana.

Locs.—Waterman Cañon, San Bernardino Mts., *Parish* 2486. Coast Ranges: Lucia, *Hall* 9992; Santa Cruz, *Bolander;* Mt. Tamalpais, *Heller* 5715; Napa Valley, *Bigelow;* Comptche, *McMurphy* 430; Eureka, *Abrams* 6219; Mt. Shasta, *Jepson* 54a. Sierra Nevada: Deer Creek, Tulare Co., *Dudley* 629; Eight Mile (Yosemite to Wawona), *Jepson* 4298; Calaveras Big Trees, *Hillebrand* 2315; Strawberry Creek, Eldorado Co., *Brainerd* 179.

Refs.—CAREX BOLANDERI Olney, Proc. Am. Acad. 7:393 (1868), type loc. Yosemite Valley, *Bolander* 6209; Mackenzie, Erythea 8:37, fig. 15 (1922). *C. deweyana* W. Boott in Bot. Cal. 2:236 (1880) in part, not Schw.; var. *bolanderi* W. Boott, l.c. *C. bromoides* W. Boott, l.c. 230, not Schk.

Sect. 12. Ovales Kunth. Densely cespitose or (rarely) with short-prolonged rootstocks. Culms triangular. Opaque part of leaf-sheaths not red-dotted or cross-rugulose, but sometimes green-striate. Spikes 2 or 3 up to 20, with several to many perigynia, the terminal gynaecandrous, the lateral pistillate or gynaecandrous, simple, the inflorescence capitate to moniliform. Perigynia scale-like or flat (except where distended by achene) to thick and plano-convex, the body subulate to reniform, narrowly to broadly wing-margined, appressed or ascending or spreading, little corky-thickened at base, prominently beaked, the beak bidentate or obliquely cut, often becoming bidentulate, usually serrulate on the margins. Achenes lenticular. Stigmas 2.

31. **C. feta** Bailey. (Fig. 31j-l.) Culms 5 to 12 dm. high, smooth; leaf-blades 2.5 to 4 mm. wide; head 2 to 8 cm. long, the spikes 5 to 15, greenish, aggregated or more or less separate, 6 to 10 mm. long, the perigynia appressed, or spreading in age; bracts inconspicuous; scales ovate, greenish, acutish; perigynia plano-convex, thickish, ovate, greenish, 3 to 3.5 mm. long, nearly nerveless ventrally, contracted into a flat beak less than ½ length of body.

Foothills and mountains, 100 to 7800 ft.: coastal Southern California; Coast Ranges; Sierra Nevada. North to British Columbia.

Locs.—Southern California: San Juan Capistrano, *Nevin;* San Bernardino Mts., *Parish* 2214. Coast Ranges: Arnolds Run, Santa Clara Co., *Dudley* 4060; Kenwood, Sonoma Co., *Bioletti* 9; Sherwood Valley, *Dudley;* Alder Point, Humboldt Co., *Tracy* 4734; Mt. Shasta, *Jepson* 53a. Sierra Nevada: Mineral King, *Dudley* 1647; Yosemite, *Jepson* 4265, 4297; Columbia, *Jepson* 6411; Avery, Calaveras Co., *A. L. Grant;* Quincy, *Jepson* 4140.

Refs.—CAREX FETA Bailey, Bull. Torr. Club 20:417 (1893); Mackenzie, Erythea 8:38, fig. 16 (1922). *C. straminea* Willd. var. *mirta* Bailey, Proc. Am. Acad. 22:151 (1886), type from Cal., *Bolander* 50. *C. lagopodioides* W. Boott in Bot. Cal. 2:237 (1880), not Schk. *C. adusta* W. Boott, l.c. 238 (in part), not Boott. *C. cristata* Schw. var. *mirabilis* W. Boott, l.c.

32. **C. fracta** Mackenzie. Culms 5 to 12 dm. high; leaf-blades 3 to 6 mm. wide; head 2.5 to 7.5 cm. long, the spikes 7 to 15, aggregated or the lower slightly separate, short-oblong or obovoid, 8 to 12 mm. long, the perigynia appressed or ascending in age; bracts inconspicuous; scales lance-ovate, acuminate or short-cuspidate, shorter than the perigynia; perigynia lance-ovate, thickish over achene, 3 to 4.5 mm. long, strongly nerved ventrally, narrowly margined, serrulate above; beak about length of body.

Mountains of Southern California; Sierra Nevada; North Coast Ranges; alt. 4000 to 7000 ft. North to Washington.

Locs.—Southern California: San Jacinto Mts., *Hall* 2665; Seven Oaks, San Bernardino Mts., *Geo. B. Grant* 4074; Mt. Wilson, *Grant* 6692 (in part). Sierra Nevada; Lloyd Mt., Tulare Co., *Dudley* 837; Kings River, *Dudley* 3263; North Fork San Joaquin River, *Congdon;* Little Yosemite, *Jepson* 3160, 4403; Yosemite, *Jepson* 4333; Cow Creek, Tuolumne Co., *Jepson* 6520; Slippery Ford, Eldorado Co., *Brainerd.* Coast Ranges: Mt. Sanhedrin, Lake Co., *Heller* 5952; Sisson, *Brainerd* 189.

Refs.—CAREX FRACTA Mackenzie, Erythea 8:38 (1922), type loc. Mt. Shasta, *Pringle. C. specifica* Bailey, Mem. Torr. Club 1:21 (1889) in small part. *C. adusta* W. Boott in Bot. Cal. 2:238 (1880) in greater part, not F. Boott. *C. scoparia* var. *fulva* W. Boott, l.c. 237 in small part.

33. **C. straminiformis** Bailey. Leaf-blades 2 to 3.5 mm. wide; head 1.5 to 2.5 cm. long, containing 3 to 6 spikes 6 to 10 mm. long with many spreading-ascending perigynia; scales ovate-lanceolate, acute, reddish-brown; perigynia broadly ovate, strongly winged, nerveless or nearly so ventrally, abruptly beaked, the beak ⅓ length of body.

High summits of the Sierra Nevada, 8000 to 11,700 ft. North to Washington.

Locs.—Cottonwood Lakes, Mt. Whitney, *Jepson* 5067; upper San Joaquin River, Madera Co., *Congdon;* Mt. Buena Vista, Mariposa Co., *Congdon;* Lake Tenaya, *Congdon;* Sonora Pass, *Jepson* 6578; Silver Mt., *Brewer* 2045; Mt. Tallac, *Hall & Chandler* 4617; Lassen Peak, *Brewer* 2184; Mt. Shasta, *Brewer* 1397.

Refs.—Carex straminiformis Bailey, Mem. Torr. Club 1:24 (1889); Kük. in Engler, Pflzr. 4^{20}:195, fig. 32E, F (1909). *C. straminea* Willd. var. *congesta* Boott, ex Olney, Proc. Am. Acad. 7:393 (1868), type loc. Mt. Shasta, *Brewer* 1375.

34. **C. multicostata** Mackenzie. Leaf-blades 2.5 to 6 mm. wide; spikes about 10, 8 to 16 mm. long; scales ovate, obtuse to acute, reddish-brown; perigynia appressed, ovate, several-nerved ventrally, winged to the rounded base, abruptly contracted into the beak 1 mm. long.

Mountains of Southern California; Sierra Nevada in Nevada Co.; rare.

Locs.—San Jacinto Mts., *Hall* 2492; Truckee River, Nevada Co., *Davy.*

Refs.—Carex multicostata Mackenzie, Bull. Torr. Club 43:604 (1917), type loc. Bear Valley dam, San Bernardino Mts., *Parish* 3609. *C. specifica* Parish, Bull. S. Cal. Acad. 5:50 (1906) in small part, not Bailey. *C. festiva* var. *stricta* Parish, l.c. 53 in small part, not Bailey.

35. **C. subfusca** W. Boott. Culms 2 to 6.5 dm. high, smooth; leaf-blades 1.5 to 3 mm. wide; head oblong or ovoid, 1 to 2 cm. long, the spikes 4 to 12, well defined but closely aggregated, ovoid or oblong, 4 to 10 mm. long, rounded at apex, rounded or somewhat tapering at base, the perigynia appressed-ascending; scales ovate, acute, brownish; perigynia ovate, plano-convex, thickish, winged to the rounded base, serrulate above, faintly nerved ventrally, contracted into beak ½ length of body or more.

High montane in coastal Southern California and in the Sierra Nevada, 4000 to 8000 ft.; Coast Ranges from Monterey Co. to Siskiyou Co., mostly 500 to 2500 ft. North to Oregon, east to Arizona.

Locs.—Southern California: Cuyamaca Mts., *Brandegee;* Palomar (Smith Mt.), *Stokes;* San Jacinto Mts., *Reed* 2483; Mt. San Gorgonio, *Hall* 7617; Mt. San Antonio, *Abrams* 1933; San Bernardino Mts., *Parish* 3261. Sierra Nevada: Bisses, Kern Co., *Dudley* 461; Salmon Creek, Tulare Co., *Hall & Babcock* 5162 (in part); Grant Park, *Dudley* 1196; Yosemite, *Dudley;* Cow Creek, Tuolumne Co., *Jepson* 6520a; Squaw Valley, Placer Co., *L. S. Smith* 555; Chico Mdws., *Heller* 12018. Coast Ranges: Tassajara Hot Sprs., *Elmer* 3133; Russian River, Sonoma Co., *Bolander* 3876; Weaverville, *Yates* 297; Castella, Shasta Co., *Piper* 6470; Mt. Eddy, Siskiyou Co., *Eggleston* 11662.

Refs.—Carex subfusca W. Boott in Bot. Cal. 2:234 (1880), type loc. Lake Tahoe, *Kellogg. C. festiva* var. *stricta* Parish, Bull. S. Cal. Acad. 5:53 (1906) in part, not Bailey.

36. **C. praticola** Rydb. Culms 2 to 7 dm. high, roughened beneath head; leaf-blades 1 to 3.5 mm. wide, flat; spikes 2 to 7, elliptic, 6 to 16 mm. long, the upper contiguous, the lower remote; bracts except lowest not developed; scales ovate, acutish, brownish tinged, shining; perigynia concealed by scales, ovate-lanceolate, 4.5 to 6.5 mm. long, narrowly winged, nearly nerveless ventrally, tapering to a short hyaline-tipped beak ⅓ length of body.

Meadows and open woods, Humboldt Co. (Eureka, Tracy 4421). North to Arctic America.

Refs.—Carex praticola Rydb. Mem. N. Y. Bot. Gard. 1:84 (1900). *C. pratensis* Drejer, Revis. Car. Bor. 24 (1841), type loc. Godthaab, Greenland, *J. Vahl;* Kük. in Engler, Pflzr. 4^{20}:198, fig. 32L, M (1909); not C. pratensis Hose in 1797.

37. **C. tracyi** Mackenzie. Head stiff, narrow, 1.5 to 4 cm. long, the spikes 4 to 7, ovoid or short-oblong, 7 to 15 mm. long; scales ovate, acute, covering perigynia, brownish-red; perigynia ovate, 4 to 5 mm. long, winged to the rounded base, serrulate above, strongly nerved dorsally and ventrally, abruptly beaked, the beak obliquely cut dorsally, at length bidentulate, dark reddish-brown at tip, shorter than body.

Humboldt Co. (Bald Mt., Tracy 4547). North to British Columbia.

Ref.—Carex tracyi Mackenzie, Erythea 8:41 (1922), type loc. Bald Mt., Humboldt Co., *Tracy* 4547.

38. **C. phaeocephala** Piper. Spikes 2 to 5 (rarely 7), 6 to 12 mm. long, forming a head 12 to 25 mm. long; lowest bract occasionally developed; scales ovate, acute, dark brownish, covering perigynia; perigynia 4.5 mm. long, obscurely nerved ventrally, contracted into a beak about 1 mm. long.

High peaks of the Sierra Nevada from Mt. Whitney to Mt. Shasta. North to Alaska, east to Colorado.

Locs.—Mt. Whitney, *Jepson*, 1078; Stanislaus Peak, *A. L. Grant* 536; Mt. Tallac, *Hall & Chandler* 4627; Mt. Shasta, *Copeland* 3568..

Refs.—CAREX PHAEOCEPHALA Piper, Contrib. U. S. Nat. Herb. 11:172 (1906), type from Ore., *E. Hall;* Mackenzie, Erythea 8:41, fig. 17 (1922).

39. **C. leporinella** Mackenzie. Spikes 3 to 8, narrowly oblong-oval, 6 to 15 mm. long, forming a head 1.5 to 3 cm. long; lowest bract occasionally somewhat developed; scales ovate, acute, reddish-brown, covering perigynia; perigynia 4 mm. long, few-nerved ventrally, tapering into a beak 1 mm. long.

High summits, central Sierra Nevada, from Mariposa Co. to Placer Co. North to Washington.

Locs.—Tuolumne Soda Sprs., *Congdon;* Summit Valley, Placer Co., *Pringle.*

Refs.—CAREX LEPORINELLA Mackenzie, Bull. Torr. Club 43:605 (1917), type loc. Pyramid Peak, Eldorado Co., *Hall & Chandler* 4716. *C. tenuirostris* Bailey, Mem. Torr. Club 1:15 (1889), not Olney.

40. **C. davyi** Mackenzie. Culms 2.5 to 3.5 dm. high, smooth, slender; leaf-blades 1.5 to 2.5 mm. wide; head about 2.5 cm. long, the spikes oblong-obovoid, 12 to 18 mm. long; bracts not developed; scales oblong-ovate, very obtuse, chestnut; perigynia thin, 7.5 mm. long, striate dorsally and ventrally, narrowly margined to base and serrulate to middle, the sharply bidentate beak not differentiated from body.

High Sierra Nevada from Placer Co. to Tulare Co., 6000 to 10,000 ft.

Locs.—Devils Basin, Eldorado Co., *Brainerd;* Calaveras Big Trees, *Hillebrand* 2322; Mt. Whitney, *Dudley* 2484.

Refs.—CAREX DAVYI Mackenzie, Bull. Torr. Club 43:606 (1917), type loc. Truckee River, Placer Co., *Davy* 3266. *C. siccata* W. Boott in Bot. Cal. 2:230 (1880), not Dew.

41. **C. specifica** Bailey. Culms 2.5 to 8 dm. high, smooth, stiff; leaf-blades 2 to 5 mm. wide; head globose, 1.5 to 4 cm. long, the spikes oblong-ovoid, 6 to 9 mm. long; bracts little developed; scales lance-ovate, acute, reddish-brown; perigynia thin, plano-convex, 6 mm. long, several to many-nerved on both faces, narrowly winged to base, serrulate above, tapering into a bidentate beak ⅓ length of body.

Sierra Nevada from Eldorado Co. to Tulare Co.

Locs.—Echo Lake, Eldorado Co., *Brainerd* 188; Silver Valley, Alpine Co., *Brewer* 1969; Yosemite, *Abrams* 5443; Soda Sprs. of the San Joaquin, *Congdon;* Marble Fork Kaweah River, *Dudley* 1790.

Refs.—CAREX SPECIFICA Bailey, Mem. Torr. Club 1:21 (1889), type loc. Silver Valley, Alpine Co., *Brewer* 1969. *C. scoparia* Schk. var. *fulva* W. Boott in Bot. Cal. 2:237 (1880), same type, excluding *Hillebrand* 2317 and Ore. spms. *C. arida* W. Boott, l.c. not Schw. & Torr. *C. lancifructus* Mackenzie, Bull. Torr. Club 43:607 (1916), type from Volcano Creek, Tulare Co., *Hall & Chandler* 5472.

42. **C. unilateralis** Mackenzie. Culms 2 to 9 dm. high, slender, leaf-blades 2 to 4 mm. wide; spikes 5 to 20, ovoid, 5 mm. long, densely aggregated into an ovoid head 1 to 3 cm. long; lowest 2 or 3 bracts dilated and strongly brownish hyaline margined at base; scales ovate, strongly cuspidate, reddish; perigynia appressed, ovate-lanceolate, thin, 4 to 5 mm. long, wing-margined, serrulate above, tapering into a short flat beak, serrulate nearly to apex.

Wet meadows and copses, Humboldt Co. North to British Columbia.

Refs.—CAREX UNILATERALIS Mackenzie, Erythea 8:43 (1922), type loc. Alton, Humboldt Co., *Tracy* 3783. *C. athrostachya* Kük. in Engler, Pflzr. 4[20]:193, fig. 32A, B (1909), not Olney.

43. **C. athrostachya** Olney. (Fig. 32a-e.) Culms 1 to 9 dm. high, slender; leaf-blades 1.5 to 4 mm. wide; spikes 4 to 20, ovoid, 4 to 10 mm. long, densely aggregated into an ovoid head 1 to 3 cm. long; lowest 2 or 3 bracts dilated and

strongly brownish hyaline-margined at base, spreading; scales ovate, shorter than the perigynia, acute or short-cuspidate, brown; perigynia ascending, ovate-lanceolate, thin, 3 to 4.5 mm. long, wing-margined, serrulate above, tapering into a beak 1 mm. long, the tip slender, terete.

Wet meadows and copses: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Lassen Co.; North Coast Ranges from Mendocino Co. to Siskiyou Co. North to Alaska, east to Colorado.

Locs.—San Bernardino Mts.: Bear Valley, *Parish* 1573. Sierra Nevada: Kaweah Peaks, *Dudley* 2081; upper San Joaquin River, Madera Co., *Congdon;* Hetch-Hetchy, *Jepson* 3477; Cow Creek, Tuolumne Co., *Jepson* 6518; Truckee, *L. S. Smith* 673; Dewitts, Lassen Co., *Davy* 3298. North Coast Ranges: Sherwood Valley, *Dudley;* Beebe's Ranch, Humboldt Co., *Tracy* 3373; Sisson, *Goldsmith* 13.

Refs.—Carex athrostachya Olney, Proc. Am. Acad. 7:393 (1868), type loc. Yosemite Valley, *Brewer* 1650; Kük. in Engler, Pflzr. 4^{20}:193, fig. 32A, B (1909); Mackenzie, Erythea 8:43, fig. 18 (1922). *C. bonplandii* Bailey, Proc. Am. Acad. 22:152 (1886) in part, not Kunth. *C. athrostachya* Olney var. *minor* Olney in Bot. King 367 (1871), type from Cal.

44. **C. festivella** Mackenzie. Culms 3 to 10 dm. high; leaf-blades 2 to 6 mm. wide; spikes 5 to 20, ovoid, 5 to 12 mm. long, densely aggregated into a head 12 to 25 mm. long; bracts inconspicuous; scales ovate, obtuse to acutish, dark chestnut to brownish-black; perigynia ovate, appressed, lightly nerved ventrally, the beak ½ length of body.

High montane, 7000 to 10,000 ft.: Sierra Nevada from Eldorado Co. to Tulare Co.; White Mts. North to Washington, east to Colorado.

Locs.—Strawberry Creek, Eldorado Co., *Brainerd* 226 in part; Sonora Pass, *Brewer* 1864; Kaweah Mdw., *Dudley* 2208. Poison Creek, White Mts., *Jepson* 7372.

Ref.—Carex festivella Mackenzie, Bull. Torr. Club 42:609 (1915), type loc. Albany Co., Wyo., *Nelson* 3275.

45. **C. nubicola** Mackenzie. Culms 1 to 4 dm. high; leaf-blades 1.5 to 4 mm. wide; head 9 to 18 mm. long, the 4 to 7 densely aggregated ovoid or subglobose spikes 5 to 9 mm. long, the perigynia ascending with spreading beaks; bracts inconspicuous; scales ovate, acute, blackish; perigynia ovate, strongly winged, abruptly contracted into a beak ½ length of body.

Summits of high mountains: Mt. Dana (our only known locality). North to Alberta, east to Colorado.

Refs.—Carex nubicola Mackenzie, Bull. Torr. Club 36:480 (1909). *C. festiva* Dew. var. *decumbens* Holm, Am. Jour. Sci. ser. 4, 16:20, 26 (1903), type from Pagosa Peak, Colo., *Baker* 232, not *C. decumbens* Ehrh. *C. festiva* Dew. var. *haydeniana* W. Boott in Bot. Cal. 2:234 (1880), type loc. Mt. Dana, *Bolander* 5074.

46. **C. pachystachya** Cham. Culms 3 to 10 dm. high; leaf-blades 2 to 4 mm. wide; spikes 4 to 8, densely aggregated or more or less separate, ovoid or suborbicular, 5 to 8 mm. long, with 10 to 30 at length spreading perigynia; scales ovate, dark colored; perigynia ovate, 3.5 to 5 mm. long, olive-brown, the beak ½ length of body.

Humboldt Co. to Siskiyou Co. North to the Aleutian Isls., east to Colorado. It has a wide altitudinal as well as a wide geographical range, and individual plants vary very considerably.

Locs.—Beebe's Ranch, Humboldt Co., *Tracy* 3390; Mt. Eddy, *Heller* 12468; Mt. Shasta, *Pringle;* Medicine Lake, *Goldsmith* 28a.

Refs.—Calex pachystachya Cham. ex Steud. Synop. Cyper. 197 (1855), type loc. Unalaska. *C. festiva* Dew. var. *pachystachya* Bailey, Mem. Torr. Club 1:51 (1889). *C. olympica* Mackenzie, Bull. Torr. Club 43:610 (1916), n. Cal. to Wash. and B. C.

47. **C. abrupta** Mackenzie. Culms 4 to 6 dm. high; leaf-blades 1.5 to 2.5 mm. wide; head suborbicular, 9 to 17 mm. long, the 4 to 8 spikes ovoid, 5 to 8 mm. long, the perigynia ascending; scales ovate, obtuse, chestnut-brown; perigynia oblong-lanceolate, 3.75 to 4 mm. long, soon brownish tinged, abruptly contracted into the beak.

High montane, 5600 to 10,000 ft., mountains of Southern California and Sierra Nevada; seacoast, Humboldt Co.

Locs.—Southern California: Mt. San Jacinto, *Reed* 2499; Mt. San Gorgonio, *Geo. B. Grant* 6403. Sierra Nevada: Poison Mdw. near Big Arroyo, upper Kern River, *Jepson* 1131; Mt. Dana, *Bolander* 5069; Strawberry, Tuolumne Co., *A. L. Grant* 109; Mt. Tallac, *Abrams* 4848; Hot Springs Valley, Lassen Peak, *Jepson* 4101; Modoc Co., *Manning* 592 (in part). Humboldt Co.: Samoa, *Tracy* 873.

Refs.—CAREX ABRUPTA Mackenzie, Bull. Torr. Club 43:618 (1917), type loc. w. branch North Fork Feather River near Stirling, *Heller* 10820; Erythea 8:45, fig. 19 (1922). *C. nervina* Parish, Bull. S. Cal. Acad. 5:26 (1906), not Bailey. *C. festiva* var. *stricta* Parish, l.c. 53 in part, not Bailey.

48. **C. mariposana** Bailey. Culms 2.5 to 6 dm. high; leaf-blades 2 to 3 mm. wide; head oblong or ovoid, 2 to 3.5 cm. long, the spikes 4 to 12, the upper approximate, the lower 1 to 3 slightly separate, oblong-ovoid, 8 to 12 mm. long, the perigynia closely appressed; scales ovate, acute; perigynia narrowly ovate, 5 mm. long, green or in age straw-colored, tapering into a beak ¼ length of body.

High montane: 5000 to 9000 ft.: Sierra Nevada from Shasta Co. to Tulare Co.; San Gabriel Mts. and San Bernardino Mts.

Locs.—Sierra Nevada: Hat Creek, Shasta Co., *Eggleston* 7880; Squaw Valley, Placer Co., *L. S. Smith* 558 (in part); Cow Creek, Tuolumne Co., *Jepson* 6515; Yosemite, *Bolander* 4962, 6222; North Fork, Fresno Co., *Griffiths;* Hockett Mdw., Tulare Co., *Dudley* 1901. Southern California: Mt. San Antonio., *Hall* 2416; Mt. San Gorgonio, *Hall* 7635.

Refs.—CAREX MARIPOSANA Bailey, Bull. Torr. Club 43:619 (1917), type loc. Tuolumne Mdws., *Jepson* 4476. *C. preslii* Parish, Bull. S. Cal. Acad. 5:52 (1906), not Steud. *C. adusta* W. Boott in Bot. Cal. 2:238 (1880) in small part, not Boott.

49. **C. integra** Mackenzie. Culms 1.5 to 3.5 dm. high, smooth; leaf-blades 1 to 2 mm. wide; head 1 to 2 cm. long, the spikes 4 to 8, densely aggregated, oblong-obovoid, 4 to 8 mm. long, the perigynia appressed-ascending; scales ovate, acute, dark chestnut; perigynia nerveless or nearly so ventrally, narrowly margined, the beak ½ length of body or more.

Montane, Sierra Nevada from Tulare Co. to Siskiyou Co., 4000 to 8000 ft. North to Oregon.

Locs.—Olancha Mt., *Hall & Babcock* 5249; upper Kings River, *Dudley;* Yosemite, *Abrams* 4399; Slippery Ford, Eldorado Co., *Brainerd* 216; Squaw Valley, Placer Co., *L. S. Smith* 556 (in part); Hat Creek, Shasta Co., *Eggleston* 7380; Mt. Shasta, *H. E. Brown* 357.

Refs.—CAREX INTEGRA Mackenzie, Bull. Torr. Club 43:608 (1917), type loc. Summit, Placer Co., *Heller* 9841; Erythea 8:46, fig. 20 (1922).

50. **C. teneraeformis** Mackenzie. Culms 3 to 4.5 dm. high, very slender, smooth or nearly so; leaf-blades averaging 1.5 mm. wide; head 1.5 to 2.5 cm. long, the spikes 5 to 8, readily distinguishable and more or less separate, 3.5 to 6 mm. long, the perigynia loosely appressed; scales ovate, acute, light brown; perigynia plano-convex, thickish, nerveless or nearly so ventrally, tapering into the slender beak 1 mm. long.

Middle altitudes, 4000 to 8000 ft.: Sierra Nevada from Butte Co. to Tulare Co.; Lake Co.; San Gabriel Mts.

Locs.—Sierra Nevada: Jonesville, Butte Co., *Hall* 9781; Gold Lake, Sierra Co., *Hall & Babcock* 4497; Calaveras Big Trees, *A. L. Grant* 4c; Strawberry, Tuolumne Co., *Jepson* 6505; Eagle Peak, Yosemite, *Jepson* 4374; Hunters Mdw., Fresno Co., *Dudley* 3261; Kaweah River, *Dudley* 1410; Mt. Sanhedrin, *Heller* 5959. Southern California: San Antonio Mts., *Swan & Chase;* Ontario Peak, *Johnston* 1503.

Ref.—CAREX TENERAEFORMIS Mackenzie, Bull. Torr. Club 43:609 (1917), type loc. Jonesville, Butte Co., *Hall* 9781.

51. **C. amplectens** Mackenzie. (Fig. 32d-f.) Culms stiff, 5 to 8 dm. high; leaf-blades 2.5 to 4 mm. wide; head 2.5 to 5 cm. long, the 6 to 12 spikes approximate, oblong-ovoid, 7 to 15 mm. long, the perigynia closely appressed; scales ovate, acute or short-cuspidate, greenish; perigynia ovate, 3.5 to 4 mm. long, light green, narrowly margined, several-nerved on both faces, contracted into a beak ½ length of body or less.

Sierra Nevada from Shasta Co. to Tulare Co., 4000 to 9000 ft.

Locs.—Hat Creek, Shasta Co., *Eggleston* 7493; Yosemite, *Jepson* 4265a, 4388 (in part); Soda Creek, Tulare Co., *Dudley* 1949.

Refs.—CAREX AMPLECTENS Mackenzie, Bull. Torr. Club 43; 611 (1917), type loc. Lover's Leap, Eldorado Co., *Brainerd* 209; Erythea 8:47, fig. 21 (1922).

Fig. 32. *a*, CAREX ATHROSTACHYA Olney, inflorescence, × 1; *b*, scale, × 8; *c*, perigynium, × 8. *d*, C. AMPLECTENS Mackenzie, inflorescence, × 1; *e*, scale, × 9; *f*, perigynium, × 9. *g*, C. MULTICAULIS Bailey, inflorescence, × 1; *h*, scale, × 4; *i*, perigynium, × 4. *j*, C. INOPS Bailey, inflorescence, × 1; *k*, scale, × 8; *l*, perigynium, × 8.

52. **C. harfordii** Mackenzie. Culms 2.5 to 8 dm. high; leaf-blades 2.5 to 4.5 mm. wide; head 1.5 to 2.5 cm. long, the 10 to 20 spikes closely aggregated, ovoid, 6 to 10 mm. long, the perigynia appressed-ascending; scales ovate; perigynia narrowly ovate, 3.5 to 4.25 mm. long, tapering into a beak ¼ length of body.

Coastal counties from Humboldt Co. to San Mateo Co.

Locs.—Humboldt Bay, *Chandler* 1115; Petaluma, *Congdon* 364; San Francisco, *Congdon;* South Cahill Ridge, San Mateo Co., *Dudley.*

Refs.—CAREX HARFORDII Mackenzie, Bull. Torr. Club 43:615 (1917), type from Cal., *Kellogg & Harford* 1073. *C. festiva* Dew. var. *stricta* Bailey, Mem. Torr. Club 1:51 (1889) at least in part, type from Cal.

53. **C. montereyensis** Mackenzie. Culms 8 to 10 dm. high; leaf-blades 2.5 to 3 mm. wide; head 1.5 to 2.5 cm. long, the 8 to 12 spikes closely aggregated, ovoid, 6 to 9 mm. long, the perigynia ascending; scales narrowly ovate; perigynia ovate, 3.25 mm. long, tapering into a beak ½ length of body.

Pine forests, Pacific Grove, Monterey Co. (Heller 6786).

Ref.—CAREX MONTEREYENSIS Mackenzie, Erythea 8:92 (1922), type loc. Pacific Grove, *C. P. Smith,* 1055.

54. **C. sub-bracteata** Mackenzie. Head 1.5 to 2.5 cm. long, the spikes 5 to 10, ovoid, 6 to 10 mm. long, the perigynia 10 to 20, appressed or in age appressed-ascending; one or more lower bracts conspicuous; scales ovate, obtuse or acutish, reddish-brown; perigynia narrowly ovate, 3.5 to 4.5 mm. long, thick plano-convex, contracted into a beak ⅓ length of body.

Coast Ranges from Humboldt Co. to Santa Barbara Co.

Locs.—Humboldt Bay, *Hall & Chandler* 1115; Mendocino City, *Bolander* 4771; Russian River, Sonoma Co., *Bolander* 3868 (in part); Lake Merced, San Francisco, *Dudley;* Santa Cruz, *Wood;* Monterey, *Parry;* Santa Barbara, *Elmer* 3756.

Ref.—CAREX SUB-BRACTEATA Mackenzie, Bull. Torr. Club 43:612 (1917), type loc. Oakland, *Bolander.*

55. **C. gracilior** Mackenzie. Head 12 to 20 mm. long, the spikes 3 to 6, the lower 1 or 2 more or less separate, suborbicular, 5 to 8 mm. long, the 4 to 12 perigynia ascending or spreading-ascending with conspicuous beaks; scales ovate, obtuse or acutish, chestnut-brown; perigynia narrowly ovate, 3.5 to 4.5 mm. long, thick, plano-convex, contracted into a beak ⅓ length of body.

Coast Ranges from Mendocino Co. to San Mateo Co.

Locs.—Sonoma, *R. Kuhn;* Petaluma, *Bolander* 4635; Berkeley, *Harriet Walker* 18; Seal Cove, San Mateo Co., *Dudley.*

Refs.—CAREX GRACILIOR Mackenzie, Bull. Torr. Club 43:614 (1917), type loc. Cloverdale, Sonoma Co., *Bolander* 3822. *C. propinqua* Boott, Pac. R. Rep. 4:154 (1857), not Nees & Meyen. *C. festiva* Dew. var. *gracilis* W. Boott in Bot. Cal. 2:234 (1880) in part, not Olney.

56. **C. pachycarpa** Mackenzie. Culms 3 to 6 dm. high, smooth; leaf-blades 2.5 to 4 mm. wide, 1 to 2 dm. long; head 1.5 to 2.5 cm. long, the spikes 5 to 8, closely aggregated, 6 to 10 mm. long, the 10 to 20 perigynia appressed; scales ovate, acute, light reddish-brown; perigynia ovate, plano-convex, thick, 5 mm. long, faintly many-striate ventrally, the beak ½ length of body.

Montane in the Sierra Nevada from Tulare Co. to Siskiyou Co., 5000 to 9000 ft.; Humboldt Co. North to Oregon.

Locs.—Sierra Nevada: Alta Mdws., Tulare Co., *Geo. B. Grant;* Mt. Goddard, *Hall & Chandler* 693; Kennedy Lake, Tuolumne Co., *A. L. Grant* 549; Truckee, *Hitchcock* 326; Lassen Peak, *Brewer* 2178; Mt. Shasta, *Brewer* 1375; ne. Modoc Co., *Manning* 952 (in part). Humboldt Co.: Dinsmore Ranch, *Tracy* 4145.

Refs.—CAREX PACHYCARPA Mackenzie, Bull. Torr. Club 43:616 (1917), type loc. Big Tree Road, Silver Valley, *Brewer* 1977. *C. adusta* Boott var. *congesta* W. Boott in Bot. Cal. 2:238 (1880), same type. *C. liddoni* var. *incerta* Bailey, Bot. Gaz. 13:88 (1888), same type.

57. **C. paucifructus** Mackenzie. Culms 1 to 2.5 dm. high; leaf-blades 1.5 to 3 mm. wide, 3 to 7 cm. long; head 1 to 2 cm. long, the spikes 4 to 8, aggregated, 6 to 9 mm. long, the perigynia appressed or appressed-ascending; scales ovate,

chestnut; perigynia 4 mm. long, ovate, thick, strongly plano-convex, nerveless ventrally, tapering into a beak ⅓ length of body.

Sierra Nevada in Sierra and Eldorado cos., 6000 to 7000 ft.

Locs.—Webber Lake, *Kennedy & Doten* 70; Tallac, *Dudley*.

Ref.—CAREX PAUCIFRUCTUS Mackenzie, Bull. Torr. Club 43:615 (1917), type loc. Devils Basin, Eldorado Co., *Brainerd* 200.

Sect. 13. Canescentes Fries. Cespitose, some species with slender stolons. Culms triangular. Sheaths not cross-rugulose. Spikes 1 to 10, with few to many perigynia, simple, the terminal gynaecandrous, the lateral pistillate or gynaecandrous, or rarely all androgynous. Bracts inconspicuous. Perigynia plano- or bi-convex, white-puncticulate, lanceolate, ovoid, oval or obovoid, appressed to spreading, beakless to prominently beaked, more or less nerved on both sides, not winged or margined, but acute-angled above, nearly or entirely filled by the lenticular achene. Stigmas 2.

58. **C. disperma** Dewey. Culms very weak, 1.5 to 6 dm. high; leaf-blades 0.75 to 2 mm. wide, flaccid; spikes distant or upper aggregated, with 1 to 5 ascending perigynia and 1 or 2 staminate flowers; scales shorter than perigynia, ovate-triangular, sharp-pointed; perigynia ovoid-elliptic, 2 mm. long, finely nerved, abruptly beaked, the beak smooth, 0.25 mm. long.

Boggy spots, Sierra Nevada from Tulare Co. to Mono Co., chiefly on the east side. North to Alaska, east to Newfoundland. Also northern Eurasia.

Locs.—Nw. of Whitney Mdws., *Coville & Funston* 1697; Bishop Creek, Inyo Co., *Davidson* 2545; Walker Lake, Mono Co., *Congdon*.

Refs.—CAREX DISPERMA Dewey, Am. Jour. Sci. 8:266 (1824), type from Mass., *Dewey*. *C. tenella* Schk. Riedgr. 1:23, pl. Pp. f. 104 (1801), Schkuhr guessed the type came from Saxony; Kük. in Engler, Pflzr. 4[20]:223, fig. 36A-c (1909), not C. tenella Thuill., 1799.

59. **C. canescens** L. Culms 1 to 8 dm. high; leaf-blades glaucous, flat, 2 to 4 mm. wide; spikes 4 to 9, 3 to 12 mm. long; scales shorter than perigynia, ovate, sharp-pointed; perigynia appressed-ascending, 1.8 to 3 mm. long, faintly few-nerved, minutely beaked, the beak with margins minutely serrulate.

Swamps and bogs, higher Sierra Nevada from Tulare Co. to Placer Co., 5000 to 9000 ft. North to Alaska, east to Virginia.

Locs.—Mineral King, *Coville & Funston* 1506; Walker Lake, Mono Co., *Congdon;* Glen Alpine Sprs., Eldorado Co., *L. M. Lathrop;* Squaw Valley, Placer Co., *L. S. Smith* 558a, 560.

Refs.—CAREX CANESCENS L. Sp. Pl. 2:974 (1753), type European; Kük. in Engler, Pflzr. 4[20]:216, fig. 35C-E (1909); Mackenzie, Erythea 8:49, fig. 22 (1922). *C. lagopina* W. Boott in Bot. Cal. 2:233 (1880), not Wahl.

60. **C. arcta** Boott. Culms 1.5 to 8 dm. high, very rough above; leaf-blades 2 to 4 mm. wide; spikes 5 to 15, 5 to 10 mm. long, aggregated; scales shorter than perigynia, ovate, obtusish to short-cuspidate; perigynia ascending or somewhat spreading, ovate, 2 to 3 mm. long, lightly nerved at base ventrally, rounded at base, the beak shallowly bidentate.

Swamps and wet woods, Humboldt Co. (Eureka, Tracy 1195, 3806). North to British Columbia, east to New Brunswick.

Refs.—CAREX ARCTA Boott, Ill. Car. 4:155, pl. 497 (1867); Kük. in Engler, Pflzr. 4[20]:228, fig. 37A-B (1909). *C. canescens* L. var. *polystachya* Boott in Richards. Arct. Exped. 2:344 (1852), type from British America.

Sect. 14. Polytrichoideae Tuckerm. Densely tufted. Culms slender. Leaf-blades narrow. Spike solitary, linear, androgynous, bractless. Rachis straight, not dilated. Perigynia appressed, membranaceous, the upper part empty, oblong-elliptic, many-nerved, not 2-ribbed, compressed-triangular, beakless. Achenes triangular, the sides concave. Stigmas 3, short.

61. **C. leptalea** Wahl. Culms 1.5 to 6 dm. high; leaf-blades 0.5 to 1.25 mm. wide; spike 4 to 15 mm. long; pistillate scales ovate, obtuse to short-pointed, ½ length of perigynia; perigynia 1 to 10, 2.5 to 4.5 mm. long, more or less strongly overlapping, round or somewhat flattened in cross-section.

Bogs and wet meadows, Humboldt Co. (Patricks Point, Tracy 4365). North to Alaska, east to the Atlantic.

Refs.—CAREX LEPTALEA Wahl. Vet. Acad. Handl. Stockholm 139 (1803); Kük. in Engler, Pflzr. 4[20]:89, fig. 21c-g (1909). *C. polytrichoides* Muhl. in Willd. Sp. Pl. 4:213 (1805), type from Penn.

Sect. 15. Firmiculmes Kük. Culms wiry, triangular, aphyllopodic, the leaf-blades often rudimentary at flowering time. Spike one, androgynous, the staminate part in age short-peduncled, the pistillate loosely few-flowered. Bracts absent. Scales more or less chartaceous. Perigynia 1 to several, obtusely triangular, smooth, 2-keeled, but otherwise nerveless, tapering at the base, very minutely beaked, the orifice truncate. Achenes triangular with nearly flat sides, closely enveloped by the perigynia, apiculate-tipped, constricted at base. Stigmas 3, elongated.

62. **C. multicaulis** Bailey. (Fig. 32g-i.) Culms 2 to 6 dm. high, deep green; leaves with well developed blades 1 or 2 to a culm; inflorescence consisting of a terminal staminate part and of 2 to several perigynia in the axils of long (the lower) or short (the upper) awned scales, these enlarged and white hyaline at base; staminate scales very obtuse, broadly white hyaline margined; perigynia oblong-obovoid, 5 to 7 mm. long.

Dry soil, coastal Southern California, 3500 to 6000 ft.: Sierra Nevada from Tulare Co. to Shasta Co., 4000 to 6000 ft.; Coast Ranges from Monterey Co. to Siskiyou Co., 100 to 4000 ft. North to Oregon.

Locs.—Southern California: Cuyamaca, *Brandegee;* San Antonio Mts., *Johnston* 1738; Mt. Lowe, *McClatchie.* Sierra Nevada; Big Tree Cañon, Tulare Co., *Coville & Funston* 1366; Eight Mile, Yosemite to Wawona, *Jepson* 4293; Strawberry Creek, Eldorado Co., *Brainerd;* Sierra Valley, *Lemmon;* Stirling, Butte Co., *Heller* 10794; Quincy, *R. M. Austin* 1004; Susanville, *Jones.* Coast Ranges: Monterey Co., *Davy* 7657; Ukiah, *Bolander* 3906; Rush Creek, Trinity Co., *Yates* 533; Siskiyou Co., *Butler* 853.

Refs.—CAREX MULTICAULIS Bailey, Bot. Gaz. 9:118 (1884), type loc. Yosemite Valley, *Torrey* 544; Mackenzie, Erythea 8:51, fig. 23 (1922). *C. geyeri* W. Boott in Bot. Cal. 2:229 (1880), not F. Boott.

63. **C. geyeri** Boott. Culms 1 to 4 dm. high; leaves with well-developed blades usually 2 to a culm, the blades thick, developing after flowering; inflorescence of the terminal staminate part with oblong-ovate striate obtusish straw-colored scales, and 2 or 3 perigynia, the lower in the axils of short-awned scales, the upper in the axils of obtusish or acutish straw-colored scales; perigynia appressed-ascending, oblong, 6 mm. long.

Dry mountain sides and open woods, Siskiyou Co. (Mt. Eddy, Eggleston 11620). North to Alberta, east to Colorado.

Refs.—CAREX GEYERI Boott, Trans. Linn. Soc. 20:118 (1846), type from the n. Rocky Mts., *Geyer;* Kük. in Engler, Pflzr. 4^{20}:94, fig. 19F-H (1909).

Sect. 16. Filifoliae Tuckerm. Densely cespitose. Leaf-blades filiform or narrow. Spike solitary, linear or linear-oblong, androgynous, densely flowered, bractless. Perigynia more or less triangular, nerveless except for the 2 lateral ribs, submembranaceous, not stipitate, not inflated, puberulent or pubescent, beaked or nearly beakless, hyaline-tipped and obliquely cut at apex. Achenes triangular, apiculate. Stigmas 3.

64. **C. exserta** Mackenzie. Culms very slender and wiry, 5 to 25 cm. high; spike 7 to 15 mm. long, the pistillate part with 2 to 12 ascending perigynia, the pistillate scales orbicular-ovate, obtuse, dull reddish brown with hyaline margins; perigynia obovoid, 2.5 mm. long, essentially beakless.

Dry places in the mountains, 4000 to 11,000 ft.: San Bernardino Mts.; White Mts.; Sierra Nevada from Tulare Co. to Eldorado Co. North to southern Oregon. Forms a large part of the "short-hair meadows" in the Sierra Nevada and is said to be readily eaten by stock.

Locs.—Bear Valley, San Bernardino Mts., *Parish* 1784. White Mts., *Jepson* 7365. Sierra Nevada: Mountain Lake, Tulare Co., *Dudley* 935; Harrison Pass, *Jepson* 5035; Black Mt., Fresno Co., *Hall & Chandler* 616; Little Yosemite, *Jepson* 4396; Yosemite, *Jepson* 4493; Dana Fork Tuolumne River, *Jepson* 3258; Tallac, *Dudley.*

Refs.—CAREX EXSERTA Mackenzie, Bull. Torr. Club 42:620 (1915); Erythea 8:52, fig. 24 (1922). *C. filifolia* Nutt. var. *erostrata* Kük. in Engler, Pflzr. 4^{20}:86 (1909), type loc. Echo Lake, Eldorado Co., *Brainerd* 111. *C. filifolia* W. Boott in Bot. Cal. 2:229 (1880), not Nutt.

Sect. 17. Scirpinae Tuckerm. Rootstocks creeping. Culms leafy below. Leaf-blades narrow. Spikes usually 1, linear, staminate or pistillate, many-flowered, normally with an empty scarcely sheathing squamiform bract a short distance below the spike. Perigynia triangular or flattened-triangular, membranaceous, 2-keeled, pubescent or puberulent, tapering at base, constricted at apex into the short cylindric entire or bidentulate beak. Achenes triangular with flat sides, sessile, apiculate. Stigmas 3, short.

65. **C. gigas** Mackenzie. Rootstocks densely matted, culms 3 to 4.5 dm. high; leaves 5 to 10, the blades 2.5 mm. wide; pistillate spike 1.5 to 2.5 cm. long, often with a second smaller peduncled spike; scales oblong-ovate, brownish, covering perigynia; perigynia numerous, black, 3 mm. long, oval, flattish, rounded at apex, the beak 0.5 mm. long, bidentate.

Siskiyou Co., 6800 to 8000 ft.; not otherwise known.

Loc.—Grizzly Hill, *Leiberg* 5104.

Refs.—CAREX GIGAS Mackenzie, Bull. Torr. Club 35:268 (1908), type loc. Siskiyou Co., *Pringle*. *C. scirpoidea* Michx. var. *gigas* Holm, Am. Jour. Sci. ser. 4, 18:20, f. 8 (1904), same type.

Sect. 18. Montanae Fries. Culms slender, leafy at base. Leaf-blades narrow, rough above. Terminal spike linear, normally staminate. Lateral spikes 1 to 5, small, pistillate or sometimes androgynous, subglobose to oblong, closely few to many-flowered, approximate and sessile or short-peduncled, or in some species basal and long-peduncled. Lowest bract squamiform or leaflet-like, sheathless or sub-sheathing. Scales often reddish-brown tinged, acute to cuspidate. Perigynia membranaceous, ascending, the body pubescent at least at base of beak, obovoid to elliptic, triangular or round-triangular in cross-section, 2-keeled, strongly stipitate at base, abruptly contracted into a cylindric emarginate to deeply bidentate hyaline-tipped beak. Achenes normally triangular, the sides convex, closely enveloped, short-apiculate. Stigmas normally 3, long.

66. **C. inops** Bailey. (Fig. 32j-l.) Strongly stoloniferous, the culms 2 to 3.5 dm. high, roughened above, reddened and fibrillose at base; leaf-blades 1.5 to 2.5 mm. wide, very rough above; staminate spike 1.5 to 2.5 cm. long, sessile or short-peduncled; pistillate spikes 1 to 3, approximate or more or less separate, sessile or short-peduncled, with 4 to 10 ascending perigynia; scales ovate, sharp-pointed; perigynia 3.5 mm. long, nearly orbicular in cross-section, the beak 0.75 to 1.5 mm. long.

Dry soil, Siskiyou Co. North to Washington.

Loc.—Pilgrim Creek, ne. of Mt. Shasta, *Goldsmith* 2.

Refs.—CAREX INOPS Bailey, Proc. Am. Acad. 22:126 (1886), type loc. Mt. Hood, Ore., *Henderson;* Mackenzie, Erythea 8:54, fig. 25 (1922). *C. verecunda* Holm, Am. Jour. Sci. ser. 4, 16:461 (1903), same type.

67. **C. globosa** Boott. Stoloniferous, the culms 1.5 to 3.5 dm. high, rough above; leaf-blades 1.5 to 2.5 mm. wide; staminate spike short-peduncled, 1 to 2 cm. long; pistillate spikes 5 to 10 mm. long, with 4 to 10 ascending perigynia; lower bract shorter than to exceeding inflorescence; perigynia 5 mm. long, the beak 0.75 to 1.25 mm. long, strongly bidentate.

Coastal counties from San Diego Co. to Sonoma Co.

Locs.—San Diego, *Brandegee;* Santa Cruz Isl., *Brandegee;* Santa Barbara, *Brewer* 302; Little Sur River, *Davy* 7317; Glenwood, Santa Cruz Co., *Dudley;* Mt. Diablo, *Brewer* 1150; Sonoma Co., *Congdon* 84.

Refs.—CAREX GLOBOSA Boott, Proc. Linn. Soc. 1:259 (1845), type from Cal., *Nuttall*. *C. umbellata* Schk. var. *globosa* Kük. in Engler, Pflzr. 4^{20}:453 (1909).

68. **C. brainerdii** Mackenzie. (Fig. 33a-c.) Culms up to 15 cm. high; leaf-blades 1.5 to 3 mm. wide, much roughened; pistillate spikes 4 to 6, 1 to 4-flowered; lower bract of non-basal spikes exceeding inflorescence, chestnut-tinged, more or less strongly sheathing; perigynia 4.5 mm. long, the beak 1 mm. long.

Sierra Nevada from Mariposa Co. to Siskiyou Co., 4000 to 5000 ft. Also in southern Oregon.

Locs.—Yosemite, *Bolander* 6196; Lassen Peak, *M. E. Jones;* Bartles (20 miles n.), Siskiyou Co., *Goldsmith* 10; Sisson, *Brown* 370.

Refs.—CAREX BRAINERDII Mackenzie, Bull. Torr. Club 40:534 (1913), type loc. Slippery Ford, Eldorado Co., *Brainerd* 121; Erythea 8:54, fig. 26 (1922).

69. **C. brevipes** W. Boott. In dense clumps from stout matted rootstocks, the culms from very short to 18 cm. high; leaf-blades 1.5 to 2.5 mm. wide; staminate spike short-peduncled or sessile, 4 to 12 mm. long; pistillate spikes 3 to 5, usually 10 to 20-flowered, the upper 1 or 2 approximate, sessile to strongly peduncled; scales ovate; perigynia with body little longer than wide.

Montane, 4000 to 7000 ft.: Sierra Nevada from Placer Co. to Tulare Co.; San Gabriel Mts. North to Washington.

Locs.—Summit, Placer Co., *Heller* 9853; Tuolumne Mdws., *Ware* 2721c; Yosemite, *Congdon;* Grant Park, *Dudley* 1905; Kaweah Peaks, *Dudley* 2446; Cucamonga Peak, *Johnston* 1496.

Refs.—CAREX BREVIPES W. Boott in Bot. Cal. 2:246 (1880), type loc. Lake Tahoe to Bear Valley, *Kellogg. C. globosa* Boott var. *brevipes* W. Boott, l.c. 485. *C. deflexa* Hornem. var. *boottii* Bailey, Mem. Torr. Club 1:43 (1889), same type. *C. rossii* Boott var. *brevipes* Kük. in Engler, Pflzr. 4^{20}:452 (1909).

70. **C. rossii** Boott. Densely cespitose; culms wiry, 5 to 25 cm. high; leaf-blades 1 to 2.5 mm. wide; staminate spike usually conspicuous, 3 to 10 mm. long; pistillate spikes globose to short-oblong, 3 to 5 mm. long, 2 to 12-flowered, the upper contiguous; scales ovate, sharp-pointed; perigynia nearly globose in cross section.

Sierra Nevada from Mariposa Co. to Shasta Co., thence west to Humboldt Co. North to Alaska, east to Michigan. The most widely distributed and abundant species of the group in the western part of the United States, but sparingly collected with us.

Locs.—Sierra Nevada: Crescent Lake, Mariposa Co., *Congdon;* Tuolumne Soda Sprs., *Congdon;* Stanislaus Forest, Alpine Co., *Eggleston* 9324; Pyramid Peak, *Hall & Chandler* 4749; Hat Creek, Shasta Co., *Eggleston* 7382. Humboldt Co.: Eureka, *Tracy,* 2041.

Refs.—CAREX ROSSII Boott in Hook. Fl. Bor. Am. 2:222 (1840), type loc. nw. coast of N. Am., *Douglas;* Kük. in Engler, Pflzr. 4^{20}:452, fig. 74E-H (1909). *C. novae-angliae* Schw. var. *rossii* Bailey, Bot. Gaz. 10:207 (1885).

71. **C. brevicaulis** Mackenzie. Stoloniferous, the culms 5 to 10 cm. high, very rough; leaf-blades 1.5 to 3.5 mm. wide; staminate spike short-peduncled, few-flowered, 6 to 9 mm. long; lateral spikes 2 to 4, 4 to 6 mm. long, the upper 1 or 2 sessile and approximate; scales ovate, acute to short-cuspidate; perigynia about 4 mm. long, the body globose, 2.25 mm. wide, the beak 1 mm. long.

Along the coast from Monterey Co. to Del Norte Co. North to British Columbia.

Locs.—Monterey, *Elmer* 4531; Ben Lomond Mt., Santa Cruz Co., *Dudley;* Seal Cove, San Mateo Co., *Dudley;* San Francisco, *Kellogg;* Crescent City, *Davy & Blasdale.*

Ref.—CAREX BREVICAULIS Mackenzie, Bull. Torr. Club 40:547 (1913), type loc. Yaquina Bay, Ore., *Howell* 2994.

Sect. 19. Digitatae Fries. Culms slender, leafy at base. Leaf-blades narrow, the sheaths usually strongly purplish. Terminal spike linear, staminate. Lateral spikes 1 to 5, approximate or separate or sometimes basal, oblong to linear, 5- to 20-flowered in few ranks, the peduncles included or exserted. Bracts sheathing, more or less strongly purplish-tinged, subspathaceous, the blade absent to rudimentary. Pistillate scales strongly purplish or reddish-brown tinged. Perigynia membranaceous, appressed, oblong-obovoid, pubescent to glabrate, triangular, long-tapering to the stipitate base, abruptly contracted into the minute beak, the orifice entire or nearly so. Achenes triangular, closely enveloped. Stigmas 3, early deciduous.

72. **C. concinnoides** Mackenzie. Strongly stoloniferous, the culms 1.5 to 3.5 dm. high, smooth; leaf-blades light green, 2 to 4 mm. wide; staminate spike nearly sessile, 8 to 22 mm. long; pistillate spikes 1 or 2, approximate, rather closely 5 to 10-flowered, sessile or short-peduncled; scales narrowly ovate, sharp-pointed, ciliate; perigynia 2.5 to 3 mm. long, loosely pubescent, the beak 0.5 mm. long, wider and longer than the scales.

Dry soil, Mendocino Co. North to British Columbia, east to Montana.

Loc.—Red Mt., nw. Mendocino Co., *Bolander* 6478 (in part).

Refs.—CAREX CONCINNOIDES Mackenzie, Bull. Torr. Club 33:440 (1906), type loc. Columbia Falls, Mont., *E. S. Williams;* Erythea 8:56, fig. 27 (1922). *C. richardsonii* W. Boott in Bot. Cal. 2:246 (1880), not R. Br.

Sect. 20. Bicolores Tuckerm. Stoloniferous. Culms central, slender, leafy toward base. Leaf-blades narrow. Basal sheaths light brown. Terminal spike linear, staminate or gynaecandrous. Lateral spikes 2 to 5, pistillate, rather closely few to many-flowered, in few ranks on erect exserted peduncles. Bracts sheathing, not colored or dark-auricled, the blades elongated, leaf-like. Scales reddish- or purplish- brown tinged. Perigynia ascending, broadly oval or ellipsoid, circular in cross section, nerved, glabrous, golden-yellow or white-pulverulent at maturity, tapering or rounded at base, essentially beakless. Achenes lenticular. apiculate, closely enveloped. Stigmas 2.

73. **C. salinaeformis** Mackenzie. (Fig. 33d-f.) Culms 5 to 15 cm. high, smooth; leaf-blades 2 to 5 mm. wide; staminate spike 8 to 16 mm. long; pistillate spikes 3 or 4, the upper approximate, short-peduncled, the lower widely separate, long-peduncled, 6 to 12 mm. long, with 8 to 15 appressed-ascending perigynia; perigynia slightly constricted at apex.

Mendocino coast, not otherwise known.

Locs.—Mendocino City, *Bolander* 4702; Fort Bragg, *Davy* 6139.

Refs.—Carex salinaeformis Mackenzie, Bull. Torr. Club 36:477 (1909), type loc. Mendocino City, *Bolander* 4702; Erythea 8:57, fig. 28 (1922). *C. salina* Wahl. var. *minor* W. Boott in Bot. Cal. 2:242 (1880), not Boott. *C. salina* Kük. in Engler, Pflzr. 4[20]:361 (1909) as to Cal. plant, not Wahl.

74. **C. hassei** Bailey. Culms 1.5 to 7 dm. high, usually much roughened above; leaf-blades 2 to 4 mm. wide; staminate spike 6 to 20 mm. long, often pistillate at apex; pistillate spikes 3 to 5, the upper approximate and short-peduncled, the lower long-peduncled, linear-oblong, 8 to 20 mm. long, with 6 to 20 ascending perigynia; perigynia obovoid, 2.5 to 3 mm. long, style becoming short-exserted and somewhat persistent.

River banks and wet rocks: San Gabriel Mts. and San Bernardino Mts.; Sierra Nevada from Tulare Co. to Siskiyou Co., 4000 to 5000 ft.; very local in the Coast Ranges. North to Alaska, east to Labrador.

Locs.—Southern California: San Gabriel River, *Hasse;* San Antonio Mts., *Johnston* 1391; San Bernardino, *Parish* 1055. Sierra Nevada: Bear Creek, Tulare Co., *Dudley* 2858; Yosemite, *Abrams* 4407; Sierra Valley, *Lemmon* 487. Coast Ranges: Mt. Pinos, Kern Co., *Hall;* Loma Prieta, Santa Clara Co., *Elmer* 4865; Sisson, *Dudley*.

Refs.—Carex hassei Bailey, Bot. Gaz. 21:5 (1896), type loc. San Antonio Cañon, San Gabriel Mts., *Hasse*. *C. aurea* Nutt. var. *celsa* Bailey, Mem. Torr. Club 1:75 (1889), type from San Bernardino Mts., *Vasey*.

75. **C. aurea** Nutt. Culms 0.3 to 5.5 dm. high, smooth or somewhat roughened; leaf-blades 2 to 4 mm. wide; staminate spike 3 to 10 mm. long; pistillate spikes 3 to 5, the upper approximate and short-peduncled, the lower separate and often strongly peduncled, 4 to 20 mm. long, with 4 to 20 ascending perigynia; perigynia umbonate, 2 to 3 mm. long.

Wet places, high montane, 5000 to 9000 ft.: Sierra Nevada from Modoc Co. to Tulare Co.; occurring locally in the San Gabriel Mts. and San Bernardino Mts. North to Alaska, east to New England.

Locs.—Sierra Nevada: Big Valley Mts., Modoc Co., *Baker & Nutting;* Little Grizzly Ranger sta., Plumas Co., *Eggleston* 7593; Glen Alpine, *McGregor* 21; Kennedy Mdw., Tuolumne Co., *A. L. Grant* 120, 180a; Mono Lake, *Brewer* 1839; Mineral King, *Coville & Funston* 1429. Southern California: Mt. Pinos, *Hall* 6518; Mt. San Antonio, *Wilder;* Bear Valley, San Bernardino Mts., *Abrams* 2847.

Refs.—Carex aurea Nutt. Gen. N. Am. Pl. 2:205 (1818), type loc. shores of Lake Michigan, *Nuttall*. *C. californica* Parish, Bull. S. Cal. Acad. 5:36 (1906), not Bailey.

Sect. 21. Paniceae Tuckerm. Stoloniferous. Culms central, slender. Basal sheaths brownish or purplish tinged. Terminal spike staminate, linear or linear-oblong. Lateral spikes 1 to 5, pistillate, loosely to rather closely several to many-flowered, in few or several ranks, on erect, exserted or included peduncles. Bracts sheathing, not colored or dark-auricled, the blades developed. Scales purplish- or reddish-brown tinged. Perigynia ascending or spreading, ovoid or obovoid, membranaceous, obtusely triangular, slightly inflated, glabrous, puneticulate, light or olive green, pointed or beaked, the orifice entire or nearly so. Achenes triangular, apiculate. Stigmas 3.

76. **C. livida** Willd. Rootstocks very slender; culms 1 to 6 dm. high, smooth, light brownish at base, phyllopodic; leaf-blades 0.5 to 3.5 mm. wide; staminate

Fig. 33. *a*, CAREX BRAINERDII Mackenzie, inflorescence, × 2; *b*, scale, × 8; *c*, perigynium, × 8. *d*, C. SALINAEFORMIS Mackenzie, inflorescence, × 1; *e*, scale, × 9; *f*, perigynium, × 9. *g*, C. CALIFORNICA Bailey, inflorescence, × 1; *h*, scale, × 8; *i*, perigynium, × 8. *j*, C. TRIQUETRA Boott, inflorescence, × 1; *k*, scale, × 8; *l*, perigynium, × 8.

spike 1.5 to 2.5 cm. long; pistillate spikes 1 or 2, approximate, sessile or short-peduncled, 1 to 2 cm. long, closely 5 to 15-flowered; perigynia 3.5 to 4.5 mm. long, the body ellipsoid, glaucous, faintly nerved, exceeding the scales.

Sphagnum bogs, Mendocino Co. (Mendocino City, Bolander 4745). North to Alaska, east to Labrador.

Refs.—CAREX LIVIDA Willd. Sp. Pl. 4:285 (1805). *C. limosa* L. var. *livida* Wahl. Vet. Akad. Handl. Stockholm 24:162 (1803), type from n. Eur.

77. **C. californica** Bailey. (Fig. 33g-i.) Rootstocks stout; culms 2 to 7 dm. high, smooth, reddish-purple at base, strongly aphyllopodic; culm-leaves 2 to 4, the blades 1.5 to 5 mm. wide, glandular-dotted beneath; staminate spike 1.5 to 3.5 cm. long; pistillate spikes 2 to 4, strongly separate, the upper short exsert-peduncled, the lower often nearly basal and long exsert-peduncled, linear-oblong, 1 to 3 cm. long, with 7 to 20 appressed perigynia; scales hispidulous; perigynia 3.5 to 4 mm. long, the body suborbicular, green, several-nerved, the beak 0.75 mm. long with slightly oblique orifice.

Meadows and prairies, Mendocino Co. (J. W. Congdon). North to Washington. Rare and local.

Refs.—CAREX CALIFORNICA Bailey, Mem. Torr. Club 1:9 (1889), type loc. Mendocino, *Bolander* 4741; Mackenzie, Erythea 8:59, fig. 29 (1922). *C. polymorpha* W. Boott in Bot. Cal. 2:247 (1880), not Muhl. *C. polymorpha* var. *californica* Kük. in Engler, Pflzr. 4^{20}:515 (1909).

Sect. 22. Laxiflorae Kunth. Cespitose. Fertile culms mostly lateral, the sterile shoots leafy, conspicuous. Basal sheaths brownish or purplish-tinged. Terminal spike staminate, linear. Lateral spikes 2 to 5, pistillate or androgynous, loosely to closely few to many-flowered, in few to several ranks, on erect to drooping, included or exserted peduncles. Bracts sheathing, the sheaths green or purplish tinged, the blades leaf-like or sometimes reduced. Scales green with hyaline margins or more or less colored. Perigynia ascending, membranaceous, triangular, usually nerved, closely enveloping the achene, glabrous or hispidulous, tapering at the base, short-beaked or beakless, the orifice entire. Achenes triangular, apiculate. Stigmas 3.

78. **C. hendersonii** Bailey. Culms 4 to 9 dm. high, sharply triangular, rough above; sterile shoots developing conspicuous culms; leaf-blades 3 to 15 mm. wide, spike 1.5 to 3 dm. long; pistillate spikes 2 to 4, erect, 12 to 25 mm. long, with 5 to 12 alternate ascending perigynia, the upper spikes approximate, the lower widely separate; scales broadly obovate, mucronate; perigynia narrowly obovoid, 5 to 6 mm. long, tapering into a straight scarcely differentiated beak.

Damp woods in the Coast Ranges from Sonoma Co. to Humboldt Co. North to British Columbia.

Locs.—Guerneville, *Davy;* Mendocino City, *Bolander* 4747; Eureka, *Tracy* 2202.

Refs.—CAREX HENDERSONII Bailey, Proc. Am. Acad. 22:115 (1886), type loc. Portland Ore., *L. F. Henderson;* Mackenzie, Erythea 8:60, fig. 30 (1922). *C. laxiflora* Lam. var. *plantaginea* Olney, Proc. Am. Acad. 8:407 (1872).

Sect. 23. Triquetrae Carey. Cespitose, leafy toward base. Leaf-blades narrow, the sheaths not purplish tinged. Terminal spike linear, staminate. Lateral spikes 2 to 4, approximate or more or less separate or sometimes basal, 5- to 30-flowered in few ranks. Bracts sheathing, not purplish tinged, the lowest with a well-developed blade. Pistillate scales greenish or hyaline or reddish-brown tinged. Perigynia membranaceous, ascending, obovoid, short-pubescent or glabrous, triangular, tapering and more or less stipitate at base, abruptly contracted into the minute beak, the orifice obliquely cut, minutely bidentate. Achenes triangular, closely enveloped. Stigmas 3, early deciduous.

79. **C. flaccifolia** Mackenzie. Culms 6 to 9 dm. high; leaf-blades about 3 mm. wide; staminate spike 1 to 2.5 cm. long, short-peduncled; pistillate spikes mostly 3, approximate or somewhat separate, sessile or short-peduncled, 1 to 2.5 cm. long, rather loosely 8- to 25-flowered; scales ovate, cuspidate; perigynia short-tapering at base, the beak 0.5 mm. long, bidentulate.

Dry plains in southwestern California.

Ref.—CAREX FLACCIFOLIA Mackenzie, Erythea 8:92 (1922), type from sw. Cal., *Geo. B. Grant,* May 1, 1902.

80. **C. whitneyi** Olney. Culms 2.5 to 10 dm. high; leaf-blades 2.5 to 8 mm. wide; staminate spike peduncled, 5 to 30 mm. long; pistillate spikes 2 to 4, approximate or lower separate, erect, sessile or short-peduncled, 7 to 30 mm. long, closely 5 to 30-flowered; scales ovate, acute or short-cuspidate; perigynia round-tapering at base.

Sierra Nevada from Tulare Co. to Plumas Co., 4000 to 7000 ft. North to Oregon.

Locs.—Tobias Mdw., Tulare Co., *Dudley* 614; Yosemite, *Jepson* 4348; Tuolumne Mdws., *Jepson* 4477; Donner Lake, *Heller* 6941; Iron Cañon, Butte Co., *R. M. Austin* 57; Devil's Kitchen, Lassen Peak, *R. M. Austin* 1300.

Refs.—Carex whitneyi Olney, Proc. Am. Acad. 7:394 (1868), type loc. Yosemite Valley, *Brewer* 1639; Mackenzie, Erythea 8:61, fig. 31 (1922).

81. **C. gynodynama** Olney. Culms 2 to 9 dm. high, slender, brownish at base; leaf-blades 3 to 9 mm. wide; terminal spike usually staminate, 1 to 2 cm. long; lateral spikes 2 to 4, oblong-cylindric, 1 to 3.5 cm. long, closely 20 to 40-flowered, the upper approximate, usually overtopping the staminate spike, short-peduncled, the lower strongly separate, long-peduncled; scales ovate-orbicular, short-cuspidate or obtuse; perigynia ascending, the beak 0.75 mm. long.

Coast Ranges from San Mateo Co. to Humboldt Co. North to Oregon.

Locs.—Pescadero, San Mateo Co., *Dudley;* Fort Ross, Sonoma Co., *Heller* 6605; Sherwood Valley, *Dudley;* Eureka, *Tracy* 3577.

Refs.—Carex gynodynama Olney, Proc. Am. Acad. 7:394 (1868), type loc. Mendocino City, *Bolander* 4700. *C. blankinshipii* Fern. Erythea 7:121 (1899), type loc. Hydesville, Humboldt Co., *Blankinship.*

82. **C. hirtissima** W. Boott. Culms 3 to 6 dm. high, erect, purplish red at base; leaf-blades 3 to 7 mm. wide; terminal spike staminate or gynaecandrous, peduncled, 1.5 to 2.5 cm. long; pistillate spikes 2 or 3, linear, 1 to 2.5 cm. long, more or less strongly separate, the lower on long-exserted peduncles, closely flowered with 20 to 30 ascending perigynia; scales ovate or obovate, cuspidate or mucronate, the margins broad, white-hyaline; perigynia ascending, the conic beak 1 mm. long.

Sierra Nevada from Nevada Co. to Mariposa Co., 3700 to 7000 ft.; Lake Co. Rare and local.

Locs.—Hetch-Hetchy, *Congdon;* e. base Mt. Sanhedrin, *Reynolds.*

Ref.—Carex hirtissima W. Boott in Bot. Cal. 2:247 (1880), type loc. Summit Sta., Nevada Co., *Kellogg.*

83. **C. triquetra** Boott. (Fig. 33j-l.) Culms 3 to 6 dm. high, stiffish; leaf-blades 2.5 to 6 mm. wide, the sheaths cinnamon-brown tinged and purplish spotted ventrally; staminate spike 1 to 3 cm. long; lateral spikes 3 or 4, erect, the upper little exsert-peduncled, approximate, the lower 1 or 2 often widely separate and long exsert-peduncled, 1 to 4.5 cm. long, the 5 to 30 perigynia ascending; scales ovate, short-cuspidate, brownish copper-color; perigynia 4 to 4.5 mm. long, softly short-pubescent, light green, obscurely several-nerved, the beak 0.3 mm. long.

Dry hillsides below 2000 ft. from Santa Barbara Co. to San Diego Co. Lower California.

Locs.—Santa Inez Mts., *Brandegee;* Ojai Valley, *Elmer* 3955; Los Angeles, *Hasse;* Avalon, *Trask;* San Antonio Mts., *Johnston* 1917; San Bernardino Valley, *Parish* 6250.

Refs.—Carex triquetra Boott, Trans. Linn. Soc. 20:126 (1846), type loc. probably near Santa Barbara, *Nuttall;* Mackenzie, Erythea 8:62, fig. 32 (1922). *C. monticola* Dew. Bot. Mex. Bound. 229 (1858), type from San Diego, *Parry.*

Sect. 24. Debiles Carey. Culms aphyllopodic, strongly purplish tinged at base, tufted, slender, leafy. Leaf-blades flat. Terminal spike normally staminate. Lateral spikes 2 to 5, elongate, narrowly linear, slender-peduncled, the lower often drooping. Bracts green-sheathing, the blades leaflike. Perigynia appressed or ascending, lanceolate to ovoid, membranaceous, obsoletely nerved, rather closely enveloping the achene, tapering to a well-developed conic beak, obliquely cut at orifice and strongly hyaline-tipped, at length bidentate. Achenes triangular, apiculate. Stigmas 3.

84. **C. mendocinensis** Olney. Culms 3 to 8 dm. high, much exceeding leaves; leaves minutely pubescent, the blades 1.75 to 4 mm. wide; staminate spike 2 to 3.5 cm. long; pistillate spikes 2 or 3, slender, erect, 1.5 to 4 cm. long, closely flowered above, the 20 to 40 perigynia appressed-ascending; scales ovate, obtuse or short-euspidate, cinnamon-brown; perigynia 3.5 to 5 mm. long, oblong-obovoid, somewhat flattened, lightly nerved, minutely puberulent, the beak 0.5 mm. long.

Along streams from Mendocino Co. to Humboldt Co. North to Oregon.

Locs.—Mendocino, *Bolander* 4701; Three Creeks, Humboldt Co., *Tracy* 3343.

Refs.—CAREX MENDOCINENSIS Olney ex W. Boott in Bot. Cal. 2:249 (1880), type loc. Mendocino City, *Bolander* 4701; Mackenzie, Erythea 8:63, fig. 33 (1922). *C. cinnamomea* Olney, Proc. Am. Acad. 7:396 (1868), type from Mendocino Co., *Bolander* 6477, not *C. cinnamomea* Boott.

Sect. 25. Frigidae Fries. Culms phyllopodic, tufted, the leaves clustered near the base. Spikes staminate, pistillate, androgynous or gynaecandrous. Bracts green-sheathing, the blades developed or rudimentary. Scales dark-tinged, usually with light midvein and margins. Perigynia appressed or ascending, flat to flattened-triangular, not inflated, dark-tinged, beaked, the beak hyaline at orifice, more or less bidentate. Achenes triangular, short apiculate. Stigmas 3.

85. **C. lemmonii** W. Boott. Culms slender, 2 to 8 dm. high, smooth, exceeding leaves; leaf-blades 1.5 to 4 mm. wide, erect; staminate spike 6 to 25 mm. long, sessile or short-peduneled; pistillate spikes 2 to 4, linear-oblong, 0.5 to 2 cm. long, 5- to 30-flowered, the upper approximate, the lower separate and exsert-peduneled; perigynia with beak 1 mm. long, sparingly ciliate-serrulate.

High montane, 6000 to 8500 ft.: Sierra Nevada from Tehama Co. to Tulare Co.; San Bernardino Mts.

Locs.—Lassen Forest, Tehama Co., *Eggleston* 7302; Strawberry Creek, Eldorado Co., *Brainerd* 30; Matterhorn Cañon, Yosemite Park, *Jepson* 4500; Mariposa Big Trees, *Congdon;* Boulder Creek, Fresno Co., *Dudley* 3298; Board Camp Creek, Tulare Co., *Dudley.* San Bernardino Mts.: High Creek, Mt. San Gorgonio, *Geo. B. Grant* 6405; Bear Valley, *Abrams* 2816.

Refs.—CAREX LEMMONII W. Boott, Bot. Gaz. 9:93 (1884), type from the Sierra Nevada, *Lemmon. C. fulva* Good. var. *hornschuchiana* W. Boott in Bot. Cal. 2:250 (1880), not F. Boott. *C. ablata* Parish, Bull. S. Cal. Acad. 4:80 (1905), not Bailey. *C. abramsii* Mackenzie, Bull. Torr. Club 36:482 (1909), type loc. San Bernardino Mts., *Abrams* 2816. *C. serratodens* Kük. in Engler, Pflzr. 4^{20}:666 (1909) in part, not W. Boott.

86. **C. luzulina** Olney. Culms 1.5 to 9 dm. high; leaf-blades 3 to 8 mm. wide, stiff; spikes 4 to 8, the upper clustered, the lower widely separated, on long-exserted peduncles, the lateral pistillate, 7 to 20 mm. long, 6 to 9 mm. wide; perigynia 4 to 5 mm. long, contracted into the short or in age eonspieuous, sparingly ciliate-serrulate dark purplish-tipped beak.

Sonoma Co. to Humboldt Co. North to southern Oregon.

Locs.—Santa Rosa Creek, *Bigelow;* Fort Bragg, *Congdon;* Bald Mt., Humboldt Co., *Tracy* 4531, 4543.

Refs.—CAREX LUZULINA Olney, Proc. Am. Acad. 7:395 (1868), type loc. Mendocino City. *Bolander* 4746. *C. cherokeensis* W. Boott in Bot. Cal. 2:248 (1880), not Schw. *C. albida* Bailey, Mem. Torr. Club 1:9 (1889), type from Santa Rosa Creek, *Thurber, Bigelow. C. luzulaefolia* W. Boott var. *ablata* Kük. f. *albida* Kük. in Engler, Pflzr. 4^{20}:558 (1909).

87. **C. ablata** Bailey. Culms slender, smooth, 2.5 to 6 dm. high, much exceeding leaves; leaf-blades 3 to 4.5 mm. wide; spikes 3 to 7, the upper clustered and sessile or nearly so, the lower usually widely separate and on slender exserted peduncles, the terminal usually staminate, the lateral mostly pistillate, 8 to 30 mm. long; perigynia lanceolate, greenish, 3.5 to 5 mm. long, obscurely nerved, slightly ciliate-serrulate, rounded at base, the beak scarcely 1 mm. long, dark purplish-tipped.

Mountain meadows and bogs, Siskiyou Co. (Shasta Forest, *Eggleston* 11668). North to British Columbia, east to Montana.

Refs.—CAREX ABLATA Bailey, Bot. Gaz. 13:82 (1888); Macoun, Cat. Canad. Pl. 4:139 (1888), type loc. Mt. Mark, Vancouver Isl., *Macoun. C. luzulaefolia* W. Boott var. *ablata* Kük. in Engler, Pflzr. 4^{20}:558 (1909).

88. **C. luzulaefolia** W. Boott. (Fig. 34a-c.) Culms 4 to 10 dm. high; leaf-blades 5 to 15 mm. wide; terminal spike peduncled, 1 to 2 cm. long, often with 1 or 2 sessile staminate spikes at its base; pistillate spikes 3 to 6, all or only the lower strongly exsert-peduncled, widely separate, the upper often equaling the staminate spikes, oblong-cylindric, 1.5 to 2.5 cm. long, the 20 to 50 perigynia appressed; perigynia 4 to 5.5 mm. long, oblong-ovate, the beak 1.5 to 2 mm. long.

High montane, 7000 to 9500 ft., Sierra Nevada from Shasta Co. to Tulare Co.

Locs.—Hat Creek, Shasta Co., *Eggleston* 7472; Mt. Tallac, *Abrams* 4838; Carson Pass, *Brewer* 2131; Kennedy Lake, Tuolumne Co., *A. L. Grant* 479; Soda Cañon near Big Arroyo, *Jepson* 1130.

Refs.—Carex luzulaefolia W. Boott in Bot. Cal. 2:250 (1880) in greater part, type loc. above Ebbetts Pass, *Brewer* 2019; Mackenzie, Erythea 8:65, fig. 34 (1922). *C. luzulaefolia* var. *strobilantha* Holm, Am. Jour. Sci. 20:305, f. 18 (1905), type loc. Donner Lake, *Heller* 7187. *C. pseudo-japonica* C. B. Clarke, Kew Bull. Misc. Inf. add. ser. 8:81 (1908), type loc. Donner Lake, *Heller* 7187.

89. **C. fissuricola** Mackenzie. Culms 5 to 8 dm. high; leaf-blades 3 to 8 mm. wide; terminal spike sessile or short-peduncled, often slightly pistillate; lateral spikes 4 or 5, the upper contiguous and sessile or short-peduncled, the lower separate and strongly peduncled; perigynia narrowly ovate, 4.5 to 5 mm. long, abruptly beaked, the beak 1.5 mm. long.

Mountain meadows, 5500 to 10,000 ft., Sierra Nevada from Tulare Co. to Placer Co. East to Nevada.

Locs.—Hockett Mdw., Tulare Co., *Dudley* 1008; Mt. Whitney, *Dudley* 2481; Mariposa Big Trees, *Congdon;* Echo, Eldorado Co., *Brainerd;* Emigrant Gap, *Jones* 2917.

Refs.—Carex fissuricola Mackenzie, Muhl. 5:53 (1909), type loc. South Fork Humboldt River, Elko Co., Nev., *Heller* 9429. *C. luzulaefolia* W. Boott in Bot. Cal. 2:250 (1880) in part. *C. ablata* Bailey var. *luzuliformis* Bailey, Bot. Gaz. 25:272 (1898), type from Cal., *Bolander* 6210. *C. luzulaefolia* W. Boott var. *ablata* Kük. f. *luzulaeformis* Kük. in Engler, Pflzr. 4^{20}:558 (1909).

Sect. 26. Anomalae Carey. Culms stout, leafy. Leaf-blades broad, flat, glabrous, not septate-nodulose. Terminal spike staminate, linear. Lateral spikes pistillate, linear-cylindric, scattered, closely many-flowered in several rows. Bracts leaflike, sheathless. Perigynia ascending or in age spreading, obovoid, small, olive green, tapering at base, triangular, slightly inflated, thin, abruptly beaked, the beak conic, lightly bidentate. Achenes triangular, apiculate, more or less closely enveloped. Stigmas 3.

90. **C. amplifolia** Boott. Long-stoloniferous, the culms 5 to 10 dm. high; leaf-blades 8 to 18 mm. wide, nearly smooth above; terminal spike 4 to 9 cm. long; pistillate spikes 3 to 6, the upper approximate, the lower more or less strongly separate, short-peduncled or nearly sessile, 3.5 to 14 cm. long; scales pointed; perigynia 3 mm. long, glabrous, nerveless except for keels, long-beaked, the beak often excurved.

Wet soil, Sierra Nevada from Tulare Co. to Butte Co., 4000 to 8000 ft.; Coast Ranges from San Mateo Co. to Siskiyou Co., 1500 to 4000 ft. Northerly to British Columbia and Idaho.

Locs.—Sierra Nevada: Mineral King, *Dudley* 1581; Dinkey Creek, Fresno Co., *Hall & Chandler* 369; Mariposa Big Trees, *Bolander* 5011; Sierra Valley, *Lemmon;* Jonesville, Butte Co., *Hall* 9782. Coast Ranges: Kings Mt., San Mateo Co., *Abrams* 5563; Howell Mt., Napa Co., *Tracy* 1606; Bald Mt., Humboldt Co., *Tracy* 4530; Sisson, *Brainerd* 98.

Refs.—Carex amplifolia Boott in Hook. Fl. Bor. Am. 2:228, pl. 226 (1840), type loc. Columbia River, *Douglas;* Mackenzie, Erythea 8:67, fig. 35 (1922).

Sect. 27. Atratae Kunth. Culms aphyllopodic or phyllopodic. Terminal spike gynaecandrous or staminate, the lateral 1 to 10 pistillate or with a few staminate flowers at base, from sessile, erect and closely approximate to long-peduncled, nodding and distant. Bracts sheathless or nearly so, dark-colored at the base, the blades short. Scales usually dark-tinged. Perigynia membranaceous or more or less coriaceous, straw-colored or greenish, often strongly dark-tinged, elliptic to broadly obovate, circular in cross-section to much flattened, papillose to puncticulate, glabrous, abruptly short-beaked or beakless, the orifice entire or bidentate. Achenes triangular, apiculate-tipped. Stigmas 3.

91. **C. spectabilis** Dew. Culms 2.5 to 5 dm. high, from densely matted tough rootstocks; leaf-blades 2 to 3.5 mm. wide; pistillate spikes 2 to 4, oblong, 1 to 2 cm. long, closely 15- to 30-flowered, not aggregated, the upper short-peduncled,

Fig. 34. *a*, CAREX LUZULAEFOLIA W. Boott, inflorescence, × 1; *b*, scale, × 4; *c*, perigynium, × 4. *d*, C. NEBRASKENSIS Dewey, inflorescence, × 1; *e*, scale, × 7; *f*, perigynium, × 7.

the lower long-peduncled; scales purplish-black with white often excurrent midvein; perigynia flattened, ovoid, sessile, 4 mm. long, abruptly minutely beaked, the beak bidentulate; achene short-stipitate.

High Sierra Nevada, 6000 to 11,000 ft., from Tulare Co. to Siskiyou Co. North to Alaska, east to Montana.

Locs.—Mt. Whitney, *Copeland* 47; Minarets, *Congdon;* Mt. Dana, *Congdon;* Carson Pass, *Brewer* 2106; Pyramid Peak, *Brewer* 2136; Lassen Peak, *Brewer* 2186; Caribou Peak, Siskiyou Co., *Dudley.*

Refs.—CAREX SPECTABILIS Dew. Am. Jour. Sci. 29:248, pl. X, f. 76 (1836), type from Rocky Mts. of Brit. Am. *C. invisa* Bailey, Proc. Am. Acad. 22:82 (1886), type from Summit Camp, Nevada Co., *Kellogg. C. podocarpa* W. Boott in Bot. Cal. 2:245 (1880), not R. Br. *C. tolmiei* Boott var. *invisa* Kük. in Engler, Pflzr. 4[20]:412 (1909).

92. **C. raynoldsii** Dew. Culms 2 to 7.5 dm. high; leaf-blades 3 to 8 mm. wide; terminal spike 1 to 2 cm. long, the lateral pistillate spikes 2 or 3, approximate or lowest separate, peduncled, erect, oblong, 1 to 2 cm. long, closely 15 to 40-flowered; perigynia oblong-oval, round in cross-section, 3.5 to 4.5 mm. long, prominently ribbed and slenderly nerved, rounded at base, the very short beak minutely bidentate.

Mountain meadows and bogs, Sierra Nevada from Tulare Co. to Siskiyou Co., 7000 to 8000 ft.. North to Canada.

Locs.—Tobias Mdw., Tulare Co., *Dudley* 616; Peregoy Mdws., Yosemite Park, *Jepson* 4340; Tuolumne Mdws., *Jepson* 3259; Calaveras Big Trees, *Hillebrand* 2323 (in part); Summit, Placer Co., *Heller* 9854; Medicine Lake, Siskiyou Co., *Goldsmith* 5a.

Refs.—CAREX RAYNOLDSII Dew. Am. Jour. Sci. ser. 2, 32:39 (1861), type loc. Pierre's Hole, Snake River Valley, Ida., *Hayden;* Mackenzie, Erythea 8:68, fig. 36 (1922).

93. **C. bifida** Boott. Culms sharply triangular, slender, smooth, 4 to 8 dm. high, the basal sheaths purplish-tinged; leaf-blades 1.75 to 3.5 mm. wide; terminal spike 1.5 to 3 cm. long, staminate or with some perigynia; pistillate spikes 3 to 5, erect, short-peduncled or sessile, oblong, 8 to 18 mm. long, with 20 to 40 at length spreading perigynia; scales ovate, sharp-pointed; perigynia narrowly ovate, flattened triangular, about 10-nerved, 3 to 4.5 mm. long, the beak 0.5 to 1 mm. long, the teeth minute, rough and purplish-tinged within.

Tehachapi Range; Coast Ranges from San Luis Obispo Co. to Humboldt Co. North to southern Oregon.

Locs.—Tehachapi, *Greene;* San Luis Obispo, *Jones* 3235; Santa Lucia Peak, *Jepson* 4739; Los Gatos, *Heller* 8570; Spring Valley, San Mateo Co., *Congdon;* Mt. Tamalpais, *Piper* 6430; Los Guilicos Valley, Sonoma Co., *Bioletti;* Red Mt., Mendocino Co., *Bolander* 6476.

Refs.—CAREX BIFIDA Boott, ex Olney, Proc. Am. Acad. 7:394 (1868), type loc. Salinas Valley, *Brewer* 574; Mackenzie, Erythea 8:69, fig. 37 (1922). *C. serratodens* W. Boott in Bot. Cal. 2:245 (1880), type from Cal. *C. aequa* C. B. Clarke, Kew Bull. Misc. Inf. add. ser. 8:86 (1908), type from San Mateo Co., *Baker* 811.

94. **C. buxbaumii** Wahl. Densely cespitose, but with long stolons; culms 2 to 9 dm. high, rough above, slender; leaf-blades 2 to 4 mm. wide, glaucous-green; spikes usually 3 or 4, erect, 8 to 40 mm. long, sessile or short-peduncled; scales awned, dark purplish-tinged, exceeding perigynia; perigynia 3 to 4 mm. long, glaucous-green, obovoid, lightly many-nerved, the apex minutely bidentate.

Bogs in the high Sierra Nevada of Tuolumne Co. (Tuolumne Soda Sprs., Bolander 5056). North to Alaska, east to the Atlantic. Eurasia.

Ref.—CAREX BUXBAUMII Wahl. Vet. Akad. Hadl. Stockholm 24:163 (1803), based on plants of Sweden and Lapland.

95. **C. helleri** Mackenzie. Very densely cespitose, the culms 0.5 to 3 dm. high; leaf-blades 2 to 3.5 mm. wide; spikes oblong, 10 to 20 mm. long, densely 25- to 50-flowered; scales acuminate or aristate, much narrower than perigynia; perigynia broadly oval to suborbicular, much flattened, 2.5 to 3.5 mm. long, nerveless, abruptly beaked, the beak 0.25 mm. long, bidentate; achenes short-stipitate.

High montane, 8500 to 13,600 ft.: Sierra Nevada from Tulare Co. to Eldorado Co.; White Mts. East to Nevada.

Locs.—Kaweah Peaks, *Dudley* 2114; Harrison Pass, *Jepson* 5039; Mt. Dana, *Bolander* 5072; Sonora Peak, *A. L. Grant* 522 (in part); Lake Lucille, *Hall & Chandler* 4663; White Mts., *Jepson* 7395.

Refs.—Carex hellerI Mackenzie, Erythea 8:70, fig. 38 (1922), type loc. Mt. Rose, Washoe Co., Nev., *Heller* 9975. *C. atrata* L. var. *nigra* W. Boott in Bot. Cal. 2:239 (1880), not F. Boott.

96. **C. epapillosa** Mackenzie. Culms 1.5 to 6 dm. high, stiff, sharply triangular, smooth; leaf-blades 3 to 8 mm. wide; spikes 3 to 6, approximate or a little separate, sessile or short-peduncled, oblong-ovoid, 1 to 2.5 cm. long, elosely flowered; scales lance-ovate, sharp-pointed, narrower than but about equaling or exceeding perigynia; perigynia broadly oval or obovate, obscurely nerved.

Mountain meadows, high Sierra Nevada of Tuolumne Co. (Sonora Peak, A. L. Grant 394, 413). Easterly to Wyoming.

Ref.—Carex epapillosa Mackenzie in Rydb. Fl. Rocky Mts. 138 (1917), type loc. Marysvale, Utah, *Jones* 5345.

97. **C. heteroneura** W. Boott. Culms 2.5 to 10 dm. high, slender, smooth or nearly so; leaf-blades 2 to 4 mm. wide; spikes 3 to 6, approximate or lower more or less strongly separate, sessile (the upper) to strongly peduncled (the lower), oblong, 0.7 to 2.5 cm. long, closely flowered with 15 to 40 appressed-ascending perigynia; scales acute, narrower than perigynia; perigynia suborbicular, strongly flattened, rounded at base and apex, the beak 0.25 mm. long, minutely bidentate.

High montane, 7000 to 11,000 ft.: coastal Southern California; White Mts.; Sierra Nevada from Tulare Co. to Nevada Co. East to western Nevada.

Locs.—Southern California: San Jacinto Mts., *Hasse;* Mt. San Gorgonio, *Geo. B. Grant* 6404. White Mts., *Jepson* 7345. Sierra Nevada: Lone Pine, *M. E. Jones;* Mt. Whitney, *Jepson* 5053; upper San Joaquin River, *Congdon;* Yosemite, *Congdon;* Tuolumne Mdws., *Jepson* 4475; Calaveras Big Trees, *Hillebrand* 2307; Sonora Pass, *A. L. Grant* 142, 277, 297; Silver Valley, Alpine Co., *Brewer* 1967; Donner Pass, *Torrey* 549.

Refs.—Carex heteroneura W. Boott in Bot. Cal. 2:239 (1880), type loc. Lake Tahoe to Bear Valley, *Kellogg;* Mackenzie, Erythea 8:71, fig. 39 (1922). *C. atrata* W. Boott l.c. not L. *C. atrata* L. var. *erecta* W. Boott l.c.; Kük. in Engler, Pflzr. 4[20]:399 (1909), type from Cal., but not otherwise given. *C. quadrifida* Bailey, Proc. Cal. Acad. ser. 2, 3:104 (1891), type loc. Mt. Dana, *Bolander* 5046, and var. *lenis* Bailey, l.c. 3:105 (1891), also based on *Bolander* 5046. *C. quadrifida* Bailey var. *caeca* Bailey, Bot. Gaz. 21:8 (1896), type from Tahquitz Valley, San Jacinto Mts., *Hasse*. *C. atrata* L. subsp. *atratiformis* Brit. f. *caeca* Kük. l.c. 400.

98. **C. albo-nigra** Mackenzie. Culms 1 to 3 dm. high; leaf-blades 2.5 to 5 mm. wide; spikes usually 3, closely approximate, sessile or very nearly so, linear-oblong, about 1 cm. long, elosely flowered with 15 to 20 appressed-ascending perigynia; scales ovate, acutish, purplish-black usually with strongly developed white margins; perigynia obovate, strongly flattened, 3 to 3.5 mm. long, substipitate, abruptly beaked, the beak 0.25 mm. long, minutely bidentate; achenes narrower than perigynia, short-stipitate.

Dry mountain sides, high Sierra Nevada in Tulare Co. (Glacier Lake, Dudley 1699). East to Arizona and Colorado.

Ref.—Carex albo-nigra Mackenzie in Rydb. Fl. Rocky Mts. 137 (1917), type from Needle Mt., Wyo., *M. Cary* 613.

99. **C. mertensii** Prescott. Culms 3 to 10 dm. high, very sharply triangular, rough; leaf-blades 4 to 7 mm. wide; spikes 1 to 4 cm. long, the upper approximate, the lower more remote on slender peduncles; scales lance-ovate, acute; perigynia appressed, broadly oval, much flattened, purple-spotted, tapering at apex, minutely beaked, the beak 0.5 mm. long, entire; achenes strongly stipitate.

Mountains, Trinity Co. (North Fork Coffee Creek, Goldsmith 20). A well marked and handsome species abundant farther north. Extending to Alaska and Montana.

Ref.—Carex mertensii Prescott, Mem. Acad. St. Petersb. ser. 2, 6:168 (1833), type loc. Sitka, Alas.

Sect. 28. Acutae Fries. Culms leafy below, aphyllopodic or phyllopodic. Terminal 1 to several spikes staminate (rarely gynaecandrous), linear, the others pistillate, linear to cylindric or oblong, closely many-flowered, sessile or peduncled. Bracts sheathless or rarely short-sheathing, leafy or squamiform, often bi-auriculate and darkened at base. Perigynia membranaceous to coriaceous, plano- or bi-convex or turgid, elliptic to obovate, punctiulate, margined, beakless or abruptly minutely beaked, the orifice entire to deeply bidentate. Achenes normally lenticular. Stigmas normally 2.

100. **C. scopulorum** Holm. Culms 1 to 4 dm. high, stiff, sharply triangular, smooth; leaf-blades 3 to 7 mm. wide with revolute margins; terminal spike staminate or androgynous; lateral spikes 2 or 3, approximate, erect, sessile or short-stalked, pistillate or androgynous, 1 to 2.5 cm. long, 6 to 7 mm. wide; perigynia 2.5 to 3.5 mm. long, soon turgid, papillose, spreading, nerveless, with short but prominent entire beak.

Sierra Nevada in Tulare Co. (nw. of Whitney Mdws., Coville & Funston 1706). North to Washington, east to Colorado.

Refs.—Carex scopulorum Holm, Am. Jour. Sci. ser. 4, 14:421, f. 1–6, and 422 (1902), type loc. Clear Creek Cañon, Colo., *Holm;* Kük. in Engler, Pflzr. 4[20]:303, fig. 46F (1909).

101. **C. gymnoclada** Holm. Culms sharply triangular, usually roughened above, developing some short blades the first year and in the flowering (second) year 2 to 4 erect blades, 2.5 to 4 mm. wide, flat with revolute margins; staminate spike short-peduncled, 5 to 15 mm. long; pistillate spikes 2 or 3, approximate, oblong or linear-oblong, 5 to 25 mm. long; perigynia appressed, obovoid, plano-convex, not turgid, 3 mm. long, often dark tinged, nerveless, granular, the beak straight, 0.25 mm. long.

High montane, 6000 to 9000 ft., Sierra Nevada from Tulare Co. to Siskiyou Co., thence west to Trinity Co. North to Washington, east to Colorado.

Locs.—Olancha Mt., *Hall & Babcock* 5248; Alta Mdws., Tulare Co., *Geo. B. Grant;* Crescent Lake, Mariposa Co., *Congdon;* Sonora Pass, *A. L. Grant* 267, 389, 411; Silver Mt., *Brewer* 2015; Strawberry Creek, Eldorado Co., *Brainerd;* Mt. Eddy, *Eggleston* 11569; Bally Mt., near Shasta City, *Brewer* 1458.

Refs.—Carex gymnoclada Holm, Am. Jour. Sci. ser. 4, 14:424 f. 12–14 (1902), type loc. Hurricane Creek, Ore., *Cusick;* Mackenzie, Erythea 8:73, fig. 40 (1922). *C. vulgaris* Fries var. *alpina* W. Boott in Bot. Cal. 2:240 (1880), not F. Boott. *C. vulgaris* Fries var. *bracteosa* Bailey, Proc. Am. Acad. 22:81 (1886), type from Ebbetts Pass, *Brewer* 2015.

102. **C. nebraskensis** Dew. (Fig. 34d-f.) Culms 2.5 to 10 dm. high, stout, rigid; leaf-blades pale green, 3 to 8 mm. wide, flat, the sheaths nodulose; staminate spikes 1 or 2, peduncled, 1.5 to 3.5 cm. long; pistillate spikes 2 to 5, oblong, sessile or short-peduncled, 1.5 to 6 cm. long, contiguous or the lower separate, with very many ascending perigynia; scales lanceolate, blackish; perigynia ascending, 3 to 3.5 mm. long, greenish straw color, compressed bi-convex, ribbed.

Meadows and swamps, 4000 to 9700 ft.: mountains of coastal Southern California; Sierra Nevada from Tulare Co. to Siskiyou Co.; Panamint Mts. North to British Columbia, east to Kansas.

Locs.—Southern California: San Jacinto Mts., *Hall* 2484; Bear Valley, San Bernardino Mts., *Abrams* 2925 (in part); Mt. Pinos, *Hall* 6519. Inyo Co.: Panamint Cañon, Panamint Mts., *Hall & Chandler* 7039; Lone Pine, *Jepson* 5154. Sierra Nevada: Huckleberry Mdw., Kaweah River, *Hopping* 465; Grant Park, *Dudley* 1204; Sonora Pass, *A. L. Grant* 390; Tallac, *Brainerd* 59; Jess Valley, Modoc Co., *Griffiths & Hunter* 432; McCloud, *Dudley.*

Refs.—Carex nebraskensis Dew. Am. Jour. Sci. ser. 2, 18:102 (1854), type from Nebr., *Hayden;* Mackenzie, Erythea 8:73, fig. 41 (1922). *C. jacintoensis* Parish, Bull. S. Cal. Acad. 4:110, pl. 16 (1905), type loc. San Jacinto Mts., *Hall* 2483.

103. **C. paucicostata** Mackenzie. Culms slender, 2.5 to 4 dm. high; leaf-blades light green, 2 to 4 mm. wide, flat or channeled at base; staminate spike solitary; pistillate spikes 4 to 6, linear, 1 to 4 cm. long, the numerous perigynia appressed-ascending; scales oblong, obtuse or acutish, blackish with lighter center; perigynia 2 mm. long, glaucous-green, the upper empty part inconspicuous, abruptly black apiculate tipped.

Wet places, mostly around lakes, Sierra Nevada from Tulare Co. to Nevada Co., 5000 to 7200 ft.

Locs.—Kern Lake, *Dudley* 2044; South Fork San Joaquin River, *Hall & Chandler* 651; Crescent Lake, Mariposa Co., *Congdon;* Yosemite, *Bolander* 6198; Lake Mary, Mono Co., *Congdon;* Silver Lake, Amador Co., *Brewer* 2099; Truckee, *Hitchcock* 258.

Refs.—CAREX FAUCICOSTATA Mackenzie, Erythea 8:74 (1922). *C. interrupta* Boeckl. var. *impressa* Bailey, Mem. Torr. Club 1:18 (1889), type loc. Summit Camp, Placer Co., *Kellogg. C. lenticularis* Boott in Bot. Cal. 2:242 (1880) in part, not Michx.

104. **C. hindsii** C. B. Clarke. Culms slender, 1 to 6 dm. high; blades 1.5 to 3 mm. wide, flat or channeled at base; staminate spike solitary, long-pedunculed; pistillate spikes 4 to 6, linear or oblong-linear, 1.5 to 4.5 cm. long, the numerous perigynia appressed-ascending; scales oblong, obtuse or acutish, blackish with lighter center, much shorter than perigynia; perigynia 2.5 to 3.5 mm. long, the upper part empty, abruptly black apiculate tipped.

Wet places along the coast, Del Norte Co. (Crescent City, W. R. Dudley). North to the Aleutian Isls.

Ref.—CAREX HINDSII C. B. Clarke, Kew. Bull. Misc. Inf. add. ser. 8:70 (1908), type loc. Columbia River, *Hinds.*

105. **C. kelloggii** W. Boott. Culms slender, 3 to 7 dm. high; leaf-blades light green, flat or channeled at base, 1.5 to 3 mm. wide; staminate spike usually solitary; pistillate spikes 3 to 5, sessile or nearly so, approximate, linear, 1.5 to 4 cm. long, often attenuate at base, the numerous perigynia appressed-ascending; scales obtuse or acutish with broad light-colored center; perigynia 2.5 mm. long, the beak abruptly black apiculate tipped.

Wet places, 4000 to 9400 ft., Sierra Nevada from Tulare Co. to Siskiyou Co. North to Alaska, east to Colorado.

Locs.—Moraine Lake, Chagoopah Plateau. *Dudley* 2211; Giant Forest, *Dudley* 2989; North Fork, Fresno Co., *Griffiths* 4572; Johnson Lake, Yosemite Park, *Congdon;* Snowy Cascade, Eldorado Co., *Brainerd* 77; Jacksons Lake, Siskiyou Co., *Dudley.*

Refs.—CAREX KELLOGGII W. Boott in Bot. Cal. 2:240 (1880), type loc. "Alta and from Lake Tahoe to Bear Valley." *Kellogg, Lemmon. C. decidua* W. Boott, l.c. 241, not F. Boott. *C. lenticularis* W. Boott, l.c. 242 in part, not Michx.

106. **C. sitchensis** Prescott. Culms 6 to 12 dm. high, stout, sharply triangular, strongly reddened at base; leaf-blades flat or channeled at base, 2 to 9 mm. wide; staminate spikes 2 to 5, slender; pistillate spikes 3 to 5, strongly separate, linear-cylindric, 3 to 9 cm. long, very many-flowered; scales lanceolate, sharp-pointed; perigynia ovate or oval, 3 to 3.5 mm. long, broadest near middle, not red-dotted, apiculate.

Near the coast from Santa Cruz Co. to Del Norte Co., thence easterly to Butte Co. North to Alaska. Very local with us.

Locs.—Santa Cruz, *Wood* 599; Twelve Mile House near San Jose, *Bolander;* Crescent City, *Dudley;* Sisson, *Jepson* 55a; Clear Creek, Butte Co., *H. E. Brown* 91.

Refs.—CAREX SITCHENSIS Prescott, Mem. Acad. St. Petersb. ser. 6, 2:169 (1832), type loc. Sitka, Alas. *C. aquatilis* W. Boott in Bot. Cal. 2:241 (1880), not Wahl.

107. **C. aquatilis** Wahl. Culms 2 to 7 dm. high, reddened at base; leaf-blades 2 to 6 mm. wide; staminate spikes 1 or 2, slender; pistillate spikes 2 to 4, sessile or short-pedunculed, not aggregated, linear, 1.5 to 6 cm. long; scales oblong-obovate to lanceolate, obtuse or acutish; perigynia elliptic-obovoid, 2.5 mm. long, broadest below apex, red-dotted, minutely beaked.

Swampy grounds, Modoc Co. (Moulton, Warner Mts., Griffiths & Hunter 474). North to Alaska, east to Quebec.

Refs.—CAREX AQUATILIS Wahl. in Vet. Akad. Nya. Handl. Stockholm 24:165 (1803), type loc. Lapland; Kük. in Engler, Pflzr. 4[38]:309, fig. 48A-D (1909), not *C. aquatilis* W. Boott in Bot. Cal. 2:241 (1880).

108. **C. barbarae** Dew. Culms 3 to 10 dm. high, stout, sharply triangular, serrulate at least in inflorescence; leaves 7 to 12, the sheaths brownish-puberulent, the blades light-green, thick, flat or channeled, 3.5 to 9 mm. wide, serrulate, the middle ones much reduced, filamentose; staminate spikes 1 or 2, narrowly linear; pistillate spikes 2 to 5, sessile or short-peduncled, oblong- or linear-cylindric, 2.5 to 8 cm. long, reddish-purple with lighter center; perigynia ascending, oval, obscurely nerved, 3 to 4.5 mm. long, at length brownish, often granular.

Mountains of coastal Southern California, Sierra Nevada foothills, Great Valley, and Coast Ranges. One of the most characteristic California species from about 20 to 4000 ft. North to Oregon.

Locs.—Southern California: Jamacha, *Chandler* 5262; Waterman Cañon, San Bernardino Mts., *Parish* 1053; Pasadena, *McClatchie;* Santa Barbara, *Parry.* Sierra Nevada and Great Valley: Kern Cañon, *Heller* 7773; Visalia, *Abrams* 5382; Kings River, *Dudley;* Marysville, *Wooton;* Mule Creek, Ione, *Braunton* 1093. Coast Ranges: Arroyo Seco, Santa Lucia Mts., *Brewer* 683; Berkeley Hills, *Jepson* 4172; Mt. Diablo. *Abrams* 5723; Mark West Creek, *Bolander;* Clear Lake, *Bolander* 2609; Ukiah, *Barrett;* Sisson, *Jepson* 57a.

Refs.—Carex barbarae Dew. Bot. Mex. Bound. 231 (1858), type loc. Santa Barbara, *Parry;* Mackenzie, Erythea 8:77, fig. 42 (1922). *C. laciniata* Boott in Benth. Pl. Hartw. 341 (1857), name only; Ill. Car. 4:175, pl. 594 (1867) in part, type from banks of the Sacramento, *Hartweg* 2022. *C. wilkesii* Olney, Bot. Wilkes Exped. 2:477, pl. 17 (1874), type from banks of the Sacramento, *Wilkes. C. lacunarum* Holm, Am. Jour. Sci. ser. 4, 17:303, f. 12–13 (1904), type from Sebastopol, *Heller* 5797. *C. magnifica* Dew. var. *lacunarum* Kük. in Engler, Pflzr. 4^{20}:366 (1909). *C. nudata* var. *anomala* Kük. l.c. 337, as to Cal. spms. *C. prescottiana* Olney in Bot. King 369 (1871) in part.

109. **C. schottii** Dew. Culms 10 to 15 dm. high, sharply triangular, very rough above; leaf-blades flat with revolute margins, serrulate, the lower sheaths hispidulous dorsally; staminate spikes about 3, elongate-linear, 8 to 14 cm. long; pistillate spikes mostly 3, sessile or nearly so, elongate-linear, 11 to 14 cm. long; scales narrowly lanceolate, acute or obtusish, purplish-black with broad 3-ribbed lighter center; perigynia appressed plano-convex, obovate, 3 mm. long, greenish straw-colored, strongly several-nerved on both faces, the beak 0.25 mm. long.

Coastal Southern California and north to Monterey Co., 20 to 2500 ft.

Locs.—Santa Ana, *Geis;* Waterman Cañon, San Bernardino Mts., *Parish* 2144; Pasadena, *Geo. B. Grant* 137; Castroville, *Elmer* 4386.

Refs.—Carex schottii Dew. Bot. Mex. Bound. 231 (1858), type loc. Santa Barbara, *Parry. C. barbarae* Parish, Bull. S. Cal. Acad. 4:108, pl. 14 (1905), not Dew.

110. **C. senta** Boott. Culms 4 to 9 dm. high, sharply triangular; leaves 6 to 12, the middle sheaths sparingly hispidulous dorsally and filamentose ventrally, the blades 3 to 5 mm. wide, the middle ones much reduced; terminal spike staminate, peduncled, 3 to 4.5 cm. long, with 1 or 2 smaller ones at base; pistillate spikes 1 to 3, sessile or short-peduncled, 2.5 to 5 cm. long; scales oblong-ovate or lanceolate, obtuse to acuminate, purplish-black with lighter center; perigynia ovate, conspicuously several-nerved on both faces, green or straw-colored, often dark-tinged and frequently strongly red-dotted, granular, the beak 0.25 mm. long.

Coastal counties from Alameda Co. to San Diego Co.; Sierra Nevada from Amador Co. to Tulare Co. East to Arizona.

Locs.—Coast Ranges: Oakland, *Bolander* 1566d; Stanford, *Schofield;* Nacimiento Creek, Monterey Co., *Dudley.* Sierra Nevada: Amador Co., *Hansen* 636; Mariposa, *Congdon;* Giant Forest, *Dudley* 2996. Southern California: Santa Paula, *Cobb* 135; Los Angeles, *Bigelow;* San Jacinto Mts., *Reed* 2558; Laguna, San Diego Co., *Schoenefeldt* 3594.

Refs.—Carex senta Boott, Ill. Car. 4:174 (1867), type loc. Santa Inez Mts., *Brewer* 350. *C. auriculata* Bailey, Mem. Torr. Club 1:19 (1889), type loc. Coloma, *Andersson. C. austromontana* Parish, Bull. S. Cal. Acad. 4:108, pl. 15 (1905), type loc. San Bernardino Mts., *Parish* 2483. *C. jamesii* W. Boott in Bot. Cal. 2:243 (1880) in small part, not Torr. *C. bishallii* C. B. Clarke, Kew Bull. Misc. Inf. Add. ser. 8:70 (1908), type from Yosemite, *Brewer* 1648. *C. nudata* W. Boott, f. *scssiliflora* Kük. in Engler, Pflzr. 4^{20}:337 (1909), type from Amador Co., *Hansen* 636. *C. nudata* Kük. l.c. in part, not W. Boott. *C. jamesii* var. *austromontana* Kük. l.c. 318. *C. jamesii* var. W. Boott in Bot. Cal. 2:243 (1880). *C. angustata* W. Boott, l.c. 242 in part, not F. Boott.

111. **C. nudata** W. Boott. Culms slender, 3 to 8 dm. high, sharply triangular, strongly dark purplish at base; leaf-blades light green, flat with revolute margins, 2.5 to 3.5 mm. wide, smooth except toward apex, the basal sheaths rounded and hispidulous dorsally; staminate spike short-peduncled, 1.5 to 3 cm. long; lateral spikes 3 to 5, sessile or short-peduncled, 1 to 4 cm. long, 6 to 7 mm. wide; bracts conspicuously bi-auriculate; scales ovate, or oblong-ovate, obtuse or acutish, blackish with lighter midvein; perigynia lanceolate or ovate, compressed biconvex, 3 to 4 mm. long, finely 6 to 9-nerved on both faces, membranaceous, greenish straw-color or purplish-black tinged, smooth or slightly granular at apex, the upper portion empty, the beak 0.25 mm. long, entire.

Rocky beds of streams, 10 to 2000 ft.: Coast Ranges from Santa Clara Co. to Siskiyou Co.; Sierra Nevada from Calaveras Co. to Shasta Co. North to western Oregon.

Locs.—Coast Ranges: Loma Prieta, *Davy* 572; Oakland Slough, *Bolander* 6202; Marin Co., *Bolander* 2299; Russian River, Sonoma Co., *Bolander* 3866; High Valley Creek, Lake Co., *Bowman* 111; Ukiah, *Bolander* 3836; Alder Point, Humboldt Co., *Tracy* 1885; Castle Rock, Sacramento River, *Goldsmith* 3. Sierra Nevada: Calaveras Big Trees, *Dudley;* Clinton, Amador Co., *Hansen* 1658; Stirling, Butte Co., *Heller* 10818; Burney Falls, Shasta Co., *Dudley.*

Refs.—CAREX NUDATA W. Boott in Bot. Cal. 2:241 (1880), based on spms. from the Coast Ranges between San Francisco Bay and Ukiah, *Bolander* 2299, 3836, 4638, 6202. *"C. decidua"* Boott in Pac. R. Rep. 4:153 (1857). *C. angustata* W. Boott, l.c. 242 in part, not F. Boott.

112. **C. eurycarpa** Holm. Culms 4 to 9 dm. high, sharply triangular, roughened above; leaf-blades 3 to 4.5 mm. wide, the lower sheaths minutely hispidulous and rounded dorsally; staminate spike peduncled, 3 to 4 cm. long; lateral spikes 3 to 5, 2 to 4 cm. long; scales lanceolate, short-acuminate, purplish-brown with prominent light midvein; perigynia appressed, 2.75 mm. long, several-nerved on both faces, minutely roughened, greenish or straw-color, the beak 0.5 mm. long, emarginate.

Boggy meadows, Sierra Nevada from Mariposa Co. to Siskiyou Co. North to Washington.

Locs.—Devils Lake, Mariposa Co., *Congdon;* Tallac, *Brainerd* 46; Squaw Valley, Placer Co., *L. S. Smith* 559; Prattville, *Heller & Kennedy* 8784; Sisson, *L. E. Smith* 691.

Ref.—CAREX EURYCARPA Holm, Am. Jour. Sci. ser. 4, 20:303 (1905), type loc. Falcon Valley, w. Klickitat Co., Wash., *Suksdorf* 1284, 2962.

113. **C. oxycarpa** Holm. Culms 4.5 to 9 dm. high, sharply triangular, slightly roughened above; leaf-blades 2 to 4 mm. wide, the lower sheaths hispidulous dorsally; terminal spike staminate, peduncled; lateral spikes 4 or 5, the upper 1 or 2 staminate, the lower 2 to 4 pistillate or androgynous, sessile or short-peduncled, 2.5 to 4.5 cm. long, 5 mm. wide; scales lanceolate, acute, purplish-black with light midvein; perigynia 3.5 mm. long, 3 to 5-striate on both faces, granular roughened, brownish, abruptly minutely apiculate, the orifice entire.

Wet meadows, northern Sierra Nevada from Butte Co. to Siskiyou Co. North to Washington and Idaho.

Locs.—Jonesville, Butte Co., *Hall* 9783; Morgan, Tehama Co., *Hall & Babcock* 4347; Sisson, *Brainerd.*

Ref.—CAREX OXYCARPA Holm, Am. Jour. Sci. ser. 4, 20:303 (1905), type loc. w. Klickitat Co., Wash., *Suksdorf* 816.

Sect. 29. Cryptocarpae Tuckerm. Stoloniferous. Culms aphyllopodic or phyllopodic. Terminal 1 to 3 spikes staminate, linear, the others pistillate, linear or oblong, closely many-flowered, the lower or all peduncled and erect or very often pendulous. Bracts sheathless, the upper at least biauriculate at base. Scales 3-nerved, usually cuspidate or aristate, but in some species obtuse. Perigynia coriaceous or membranaceous, plano- or bi-convex or turgid, elliptic to obovate, punctiulate, margined, abruptly minutely beaked or beakless, the orifice entire or nearly so. Achenes lenticular, apiculate, constricted in the middle. Stigmas 2.

Fig. 35. *a*, CAREX OBNUPTA Bailey, inflorescence, × ⅔; *b*, scale, × 5; *c*, perigynium, × 5. *d*, C. SPISSA Bailey, inflorescence, × ⅔; *e*, scale, × 6; *f*, perigynium, × 6.

Fig. 36. *a*, CAREX YOSEMITANA Bailey, inflorescence, × 1; *b*, scale, × 7; *c*, perigynium, × 7. *d*, C. LANUGINOSA Michx., inflorescence, × 1; *e*, scale, × 10; *f*, perigynium, × 10.

114. **C. lyngbyei** Hornem. Culms 3 to 9 dm. high; leaf-blades flat, 2 to 12 mm. wide; uppermost spike staminate, long-peduncled; lateral spikes 2 to 6, the upper 1 or 2 often staminate or androgynous, the lower pistillate, drooping, linear or oblong, 2 to 8 cm. long; perigynia oblong-oval, bi-convex, 2.5 to 3 mm. long, very minutely beaked.

Humboldt Co. coast (Humboldt Bay, Tracy 3149). North to the Aleutian Isls. Widely distributed in Arctic regions.

Ref.—CAREX LYNGBYEI Hornem. Fl. Dan. pl. 1888 (1827), type from Faroe Isls., Eur.

115. **C. obnupta** Bailey. (Fig. 35a-c.) Culms 5 to 15 dm. high; leaf-blades 5 to 8 mm. wide, thick; staminate spikes 2 or 3, pistillate spikes 2 to 4, oblong to linear-cylindric, 3 to 10 cm. long, strongly peduncled; scales narrowly ovate, blackish, sharp-pointed, concealing perigynia; perigynia coriaceous, 3 to 3.5 mm. long, abruptly minutely beaked, the beak entire.

Coastal counties from Monterey Co. to Del Norte Co. and local in the Sacramento Valley. North to British Columbia.

Locs.—Santa Lucia Mts., *Plaskett* 42; Santa Cruz, *Dudley;* Berkeley, *Davy;* Abbotts Lagoon, Pt. Reyes, *Jepson* 1170; Sebastopol, *Congdon;* Sycamore Slough, Colusa Co., *Ferris* 607; Mendocino, *Pringle;* Humboldt Bay, *Tracy* 2459; Crescent City, *Dudley.*

Refs.—CAREX OBNUPTA Bailey, Proc. Cal. Acad. ser. 2, 3:104 (1891), type loc. San Mateo Co., *Kellogg;* Mackenzie, Erythea 8:81, fig. 43 (1922). *C. aquatilis* W. Boott in Bot. Cal. 2:241 (1880), not Wahl. *C. sitchensis* Boott in Hook. Fl. Bor. Am. 2:220, pl. 221 (1840), not Prescott. *C. schottii* Kük. in Engler, Pflzr. 4[20]:365 (1909), not Dew.

Sect. 30. Trachychlaenae Drejer. Phyllopodic. Culms very stout, leafy below, the lower sheaths strongly filamentose ventrally. Spikes numerous, the upper 3 to 6 staminate, elongated, the lower 3 to 6 pistillate (or staminate at apex), linear-cylindric, densely very many-flowered, the lower at least long-peduncled. Lowest bract about equaling or exceeding the inflorescence, short-sheathing. Pistillate scales mucronate or aristate. Perigynia obovoid or oblong, glabrous, roughened or hispidulous, membranaceous, slightly inflated, apiculate-beaked, the orifice emarginate. Achene triangular, the sides flat or slightly concave. Stigmas 3.

116. **C. spissa** Bailey. (Fig. 35d-f.) Rootstocks stout, woody; culms 1 to 2 m. high, obtusely triangular, smooth; leaf-blades glaucous-green, 7 to 14 mm. wide, flat with revolute strongly serrulate margins, the sheaths brownish tinged; pistillate spikes separate, erect, sessile or nearly so, 6 to 14 cm. long, the perigynia squamose at maturity; scales narrowly ovate, serrulate-awned, light brownish; perigynia 3 to 4.5 mm. long, becoming somewhat inflated, very abruptly beaked, the beak 0.5 mm. long, the style very strongly bent and twisted; achenes elliptic-obovoid.

Banks of streams at low altitudes from Los Angeles Co. to San Diego Co. South to Lower California.

Locs.—Glendale, *Hasse;* Mt. Wilson, *Davidson;* Tecate River, *Mearns* 3787; Lakeside, *Brandegee.*

Refs.—CAREX SPISSA Bailey, Proc. Am. Acad. 22:70 (1886), type loc. San Diego Co., *Pringle;* Mackenzie, Erythea 8:83, fig. 44 (1922).

Sect. 31. Hirtae Tuckerm. Culms stout, leafy. Rootstocks with long stolons. Leaves septate-nodulose. Spikes 3 to 10, the upper 1 to 5 staminate, slender, the others pistillate, many-flowered, erect. Bracts leaflike, equaling or exceeding the culm, often sheathing. Pistillate scales ovate or lanceolate, acute or aristate. Perigynia mostly ascending, coriaceous, ovoid or oblong-ovoid, somewhat inflated, nearly orbicular in cross-section, many-nerved, often hairy, round-tapering at base, tapering into the bidentate beak. Achenes triangular, often stipitate, the sides flat or deeply concave, apiculate. Stigmas 3.

117. **C. yosemitana** Bailey. (Fig. 36a-c.) Cespitose from stout rootstocks; culms 3 to 9 dm. high; leaf-blades not rigid, 3 to 7 mm. wide; terminal spike linear, 12 to 30 mm. long, more or less peduncled, occasionally with a few perigynia; pistillate spikes 3 or 4, more or less separate, sessile or nearly so, oblong-cylindric, 1 to 4 cm. long, closely flowered, often staminate at apex; scales lance-ovate, sharp-pointed, ciliate, chestnut-brown; perigynia 2.5 to 3.5 mm. long,

obovoid, or oblong-obovoid, obscurely nerved, abruptly short-beaked, the beak 0.5 mm. long.

Montane, 4000 to 8000 ft.: Sierra Nevada from Tuolumne Co. to Tulare Co.; San Jacinto Mts.

Locs.—Little Yosemite, *Jepson* 4395; Dunlap, *Griffiths* 4682; Mt. Silliman, *Dudley* 1504; San Jacinto Mts., *Parish* 1574.

Refs.—CAREX YOSEMITANA Bailey, Mem. Torr. Club 1:8 (1889); Mackenzie, Erythea 8:83, fig. 45 (1922). *C. sartwelliana* Olney, Proc. Am. Acad. 7:396 (1868), type loc. Yosemite Valley, *Brewer* 1636, not *C. sartwellii* Dew. 1842. *C. congdonii* Bailey, Bot. Gaz. 21:6 (1896), type loc. Mt. Warren Pass, Tuolumne Co., *Congdon*.

118. **C. oregonensis** Olney. Rootstocks slender, woody, creeping; culms 1 to 5 dm. high, rigid, smooth; leaf-blades thick, rigid, 3 to 5 mm. wide, canaliculate, mostly exceeding culms; terminal 2 or 3 spikes staminate, linear, 8 to 25 mm. long; pistillate spikes 3 or 4, 1.5 to 5 cm. long, the lower more or less separate, closely erect, closely flowered above or loosely below, the perigynia appressed ascending; scales ovate, acute to cuspidate, chestnut brown tinged; perigynia ovoid, obtusely triangular, 4 to 5 mm. long.

Mountain meadows, Siskiyou Co. (Medicine Lake, Goldsmith 29, 29a). North to Washington.

Refs.—CAREX OREGONENSIS Olney, Proc. Am. Acad. 8:407 (1872), type from Ore., *Hall;* Bailey, Proc. Am. Acad. 22:73 (1886); Kük. in Engler, Pflzr. 4^{20}:745, fig. 127 (1909); Mackenzie, Erythea 8:84, fig. 46 (1922). *C. halliana* Bailey, Bot. Gaz. 9:117 (1884), type from Ore., *Hall*, not. *C. hallii* Olney (1871).

119. **C. lanuginosa** Michx. (Fig. 36d-f.) Culms 3 to 10 dm. high, sharp-angled and rough above; leaf-blades flat, 1.5 to 5 mm. wide, rough; staminate spikes 1 to 3, up to 3 cm. long, distant; pistillate spikes 1 to 3, oblong-cylindric, 1 to 5 cm. long, sessile or short-peduncled, closely flowered; scales lanceolate, acuminate or aristate, reddish-brown tinged; perigynia broadly ovoid, 2.5 to 3.5 mm. long, the nerves obscure.

Wet meadows or swamps in the valleys and mountains, 500 to 8000 ft.: coastal Southern California; western Mohave Desert; upper San Joaquin Valley; Sierra Nevada from Tulare Co. to Siskiyou Co. North to British Columbia, east to Nova Scotia.

Locs.—Southern California: Santa Ana, *Geis* 559; El Monte, Los Angeles, *Johnston;* San Bernardino Valley, *Parish* 1052; Victorville, *Parish* 9705. Greenfield, Kern Co., *Davy* 1830. Sierra Nevada: Mt. Whitney, *Dudley* 2509; Snow Creek, Yosemite, *Congdon;* Kennedy Mdw., Tuolumne Co., *A. L. Grant* 222a; Lake Tahoe, *L. S. Smith* 640; Jess Valley to Blue Lake, *Griffiths & Hunter* 426; Sisson, *Jepson* 5792.

Refs.—CAREX LANUGINOSA Michx. Fl. Bor. Am. 2:175 (1803), type loc. Lake Mistassins, Canada; Mackenzie, Erythea 8:85, fig. 47 (1922). *C. aemato-rhyncha* Olney in Bot. King 373 (1871), not Desv. *C. filiformis* L. var. *latifolia* Boeckl. Linnaea 41:309 (1877), based primarily on *C. lanuginosa* Michx. *C. filiformis* L. var. *aematorhyncha* W. Boott in Bot. Cal. 2:250 (1880). *C. lasiocarpa* Ehrb. var. *lanuginosa* Kük. in Engler, Pflzr. 4^{20}:748 (1909). *C. watsoni* Olney l.c. 370, type loc. Carson City, Nev., *Watson* 1246.

120. **C. sheldonii** Mackenzie. Culms very smooth below the spikes, 5 to 10 dm. high, not fibrillose at the base; leaf-blades 3.5 to 6 mm. wide, the sheaths dark-tinged at the mouth, the basal breaking and slightly filamentose; staminate spikes 2 or 3, distant; pistillate spikes usually 2, 2 to 5 cm. long, rather closely flowered; scales ovate-lanceolate, acuminate or cuspidate; perigynia 5 to 6 mm. long.

Swamps, Warner Mts., northeastern California (Jess Valley to Blue Lake, Griffiths & Hunter 429). North to Oregon, east to Idaho.

Ref.—CAREX SHELDONII Mackenzie, Bull. Torr. Club 42:618 (1915), type loc. Clarks Creek, Ore., *Sheldon* 8854.

Sect. 32. Extensae Fries. Culms slender but strict, obtusely triangular, leafy toward base. Leaves sparingly septate-nodulose, the blades narrow. Spikes 2 to 10, the terminal usually staminate, the others pistillate, suborbicular to oblong, densely flowered, 3 cm. or less long, the upper sessile and approximate, the lower remote, pedunculed, erect. Bracts leafy, more or less sheathing. Pistillate scales ovate, mostly reddish, copper or chestnut tinged. Perigynia ascending, spreading or deflexed, membranaceous, smooth, many-nerved, somewhat inflated, obscurely triangular, rounded at base, contracted into a bidentate beak, the teeth very erect. Achenes triangular with flat sides. Stigmas 3.

121. **C. viridula** Michx. Densely cespitose, the culms 0.6 to 3 dm. high, smooth; leaf-blades 1 to 3 mm. wide, canaliculate; staminate spike sessile or short-pedunculed; pistillate spikes 2 to 6, 4 to 12 mm. long; scales ovate, much shorter than perigynia, obtuse or acutish; perigynia 2 to 3 mm. long, the beak scarcely ½ length of body.

Swamps on the Mendocino Coast (Inglenook, J. W. Congdon). North to Alaska, east to the Atlantic.

Ref.—Carex viridula Michx. Fl. Bor. Am. 2:170 (1803), type from Canada.

Sect. 33. Physocarpae Drejer. Culms mostly tall and stout. Leaves septate-nodulose, not hairy. Spikes 2 to 10, the upper 1 to 5 staminate, the others normally pistillate, subglobose to linear-cylindric, generally closely many-flowered, erect, short-pedunculed, more or less remote. Bracts leaflike, much exceeding the inflorescence, normally sheathless. Perigynia ascending, spreading or even reflexed, membranaceous, smooth, from little to much inflated, suborbicular in cross-section, coarsely many-ribbed or nerveless, contracted into a beak, the beak entire to bidentate. Achenes much shorter than perigynia, triangular or lenticular. Stigmas 3 or 2.

122. **C. vesicaria** L. Rootstocks short-creeping and stoloniferous; culms 3 to 10 dm. high, aphyllopodic, purplish-tinged at base; leaf-blades 2 to 7 mm. wide, the sheaths sparingly nodulose dorsally; staminate spikes 2 to 4, linear, 2 to 4 cm. long; pistillate spikes 1 to 3, sessile or short-pedunculed, oblong-cylindric, 2.5 to 7.5 cm. long, more or less strongly separate; scales ovate-lanceolate, sharp-pointed; perigynia ovoid, yellowish-green or darker tinged.

Wet meadows and swamps: Coast Ranges from Marin Co. to Siskiyou Co., 20 to 2000 ft.; Sierra Nevada from Tulare Co. to Siskiyou Co. North to British Columbia, east to the Atlantic. Very variable.

Locs.—Coast Ranges: Tomales Bay, *Bolander* 2303; Sebastopol, *Heller* 5798; Cahto, Mendocino Co., *Bolander* 4689. Sierra Nevada: Kaweah Mdws., *Purpus* 2097; Kings River Cañon, *Dudley* 3192; Nellie Lake, Fresno Co., *A. L. Grant* 1083; Lake Mary, Mono Co., *Congdon;* Yosemite, *Jepson* 5666; Hetch-Hetchy, *Jepson* 4633, 3476; Squaw Valley, Placer Co., *L. S. Smith* 567; Prattville, Plumas Co., *Heller & Kennedy* 8818; Egg Lake, Modoc Co., *Baker;* Medicine Lake, Siskiyou Co., *Goldsmith* 27.

Refs.—Carex vesicaria L. Sp. Pl. 2:979 (1753), type European; Kük. in Engler, Pflzr. 4^{20}:725, fig. 124H (1909); Mackenzie, Erythea 8:87, fig. 48 (1922). *C. monile* Tuck. var. *pacifica* Bailey, Proc. Cal. Acad. ser. 2, 3:105 (1891), type loc. Yosemite, *Brewer* 1654. *C. trichocarpa* Muhl. var. *imberbis* W. Boott in Bot. Cal. 2:251 (1880), not Carey. *C. monile* W. Boott, l.c. not Tuck. *C. vesicaria* L. var. *pacifica* Kük. and var. *colorata* Kük. in Engler, Pflzr. 4^{20}:726 (1909). *C. vesicaria* L. var. *obtusisquamis* Bailey, Carex Cat. 4 (1884); Bot. Gaz. 9:121 (1884), type from Yosemite, *Brewer* 1781.

123. **C. exsiccata** Bailey. Rootstocks short-creeping; culms 3 to 10 dm. high, rough above, aphyllopodic, purplish-tinged at base; leaf-blades 3 to 7 mm. wide, the sheaths sparingly nodulose dorsally; staminate spikes 2 to 4, 2 to 4.5 cm. long, narrow; pistillate spikes 1 to 3, sessile or short-pedunculed, more or less strongly separate, cylindric, 2 to 7.5 cm. long; scales lanceolate-ovate, sharp-pointed; perigynia lanceolate, olive green.

Wet places along the coast from Santa Cruz Co. to Humboldt Co. North to Alaska, east to Montana.

Locs.—Wrights, Santa Clara Co., *Dudley;* Woodside, San Mateo Co., *Dudley;* Tomales Bay, *Bigelow;* Ft. Bragg, *Mathews* 21; Eureka, *Tracy* 1194.

Refs.—Carex exsiccata Bailey, Mem. Torr. Club 1:6 (1889); Mackenzie, Erythea 8:88, fig. 49 (1922). *C. vesicaria* L. var. *major* Boott in Hook. Fl. Bor. Am. 2:221 (1840), type from Columbia River, *Douglas, Scouler.*

124. **C. rostrata** Stokes. Cespitose, sending forth long horizontal stolons; culms phyllopodic, 3 to 12 dm. high; leaf-blades 2 to 12 mm. wide; staminate spikes 2 to 4, slender, 1 to 6 cm. long; pistillate spikes 2 to 5, remote, cylindric, sessile or short-peduncled, 1 to 15 cm. long; scales lanceolate, sharp-pointed; perigynia ovoid, 4 to 6 mm. long, greenish straw color or darker tinged.

Swampy places: abundant in the Sierra Nevada from Butte Co. to Tulare Co., 4000 to 6200 ft.; San Bernardino Mts.; San Francisco Bay region. North to Alaska, east to the Atlantic.

Locs.—Sierra Nevada: Chico Mdws., *Heller* 11494; Truckee, *Heller* 7108; Walker Lake, Mono Co., *Congdon;* Yosemite, *Bolander* 4968; Bishop Creek, Inyo Co., *Davidson* 2555; Grant Park, *Dudley* 1225; Little Kern Lake, Kern River Cañon, *Jepson* 4940. Bear Valley, San Bernardino Mts., *Abrams* 2850. San Francisco, *Bolander* 152.

Refs.—Carex rostrata Stokes in With. Arrang. Brit. Pl. ed. 2, 2:1059 (1787), type from Great Britain; Mackenzie, Erythea 8:89, fig. 50 (1922).

Sect. 34. Pseudo-Cypereae Tuckerm. Culms tall, generally stout, acutely angled, leafy below. Leaf-blades flat, septate-nodulose. Spikes 3 to 9, the upper 1 to 3 slender, staminate, the others normally pistillate, densely flowered, the upper approximate, the lower remote and strongly peduncled, often nodding. Bracts leaflike, much exceeding the culms, mostly not sheathing. Pistillate scales aristate. Perigynia spreading or reflexed, membranaceous or stiff, triangular or circular in cross-section, 3 to 8 mm. long, closely many-ribbed, greenish straw-color, smooth, stipitate, contracted into a rigid beak, the teeth slender. Achenes triangular. Stigmas 3, short.

125. **C. hystricina** Muhl. Cespitose and stoloniferous; culms 1.5 to 10 dm. high, rough above; leaf-blades 2 to 10 mm. wide; staminate spike 1 to 5 cm. long, slender-peduncled; pistillate spikes 1 to 4, approximate or strongly separate, densely many-flowered, oblong or oblong-cylindric, 1 to 6 cm. long, the lower slender-peduncled; scales green, 3-nerved, rough-awned, narrower and mostly shorter than perigynia; perigynia 5 to 7 mm. long, ascending or at length spreading.

Swampy soil, Trinity Co. (Rush Creek, Yates 423). North to Alberta, east to the Atlantic.

Ref.—Carex hystricina Muhl. in Willd. Sp. Pl. 4:282 (1805), type from Penn.

126. **C. comosa** Boott. Cespitose and not stoloniferous; culms 5 to 15 dm. high, strongly roughened to smooth; leaf-blades 6 to 16 mm. wide; staminate spike 3 to 7 cm. long, slender-peduncled; pistillate spikes 1 to 4, densely many-flowered, oblong-cylindric, 1 to 7.5 cm. long, the upper erect and short-peduncled, the lower slender-peduncled and at length nodding; scales narrow, mostly shorter than perigynia, very rough-awned; perigynia lanceolate, rigid, 5 to 7 mm. long, reflexed when mature.

Swamps near the coast: San Bernardino Valley; Santa Cruz Mts. to Lake Co. North to Washington, east to the Atlantic.

Locs.—Santa Cruz Mts., *Bolander* 69; San Francisco, *Bolander* 2301 (in part); Guerneville, *Davy;* Blue Lakes, *Jepson* 26a, 26b.

Refs.—Carex comosa Boott, Trans. Linn. Soc. 20:117 (1846). Ga. and Car., *Elliott;* Mackenzie, Erythea 8:91, fig. 51 (1922). *C. furcata* Ell. Sketch Bot. S. Car. and Ga. 2:552 (1824), S. Car. and Ga., not C. furcata Lapeyr. (1813). *C. pseudo-cyperus* L. var. *comosa* Boott, Ill. Car. 4:141 (1867).

Fig. 37*a*. WASHINGTONIA FILIFERA Wendl. at the springs called Twenty-nine Palms, on the north border of the Colorado Desert 40 miles north of Mecca. There were 16 palms living in 1914, the tallest one being 70 feet high with a trunk 2¾ feet in diameter. (Jepson, photo.)

Fig. 37*b*. WASHINGTONIA FILIFERA Wendl. in the cañon called Hidden Palms about 18 miles northerly from Indio. (Jepson, photo.)

PALMACEAE. Palm Family.

Commonly trees with fibrous roots and columnar unbranched trunks covered with leaf-scars or the bases of leaf-stalks and bearing a tuft of large leaves at summit. Leaves sharply plaited when young, eventually tearing more or less along the lines of the folds. Flowers minute, commonly monoecious, in ours perfect, borne in a large inflorescence enclosed by a spathe. Perianth in two circles, an outer 3-lobed calyx and an inner 3-parted corolla. Stamens 6, inserted on the corolla-tube. Carpels 3, separate or united, each 1-ovuled. Fruit a berry, drupe or nut.—Genera 128 and species about 1200, almost entirely in the tropics.

1. WASHINGTONIA Wendl. Fan Palm.

Trees with fan-shaped much folded blades and long petioles armed with stout hooked spines along the margins. Pistil 1; ovary 3-celled; style and stigma 1. Fruit a berry.—Species 3, Southern and Lower California and Sonora.

Bibliog.—Parish, S. B., California Palms (Gard. & For. 3:51–52,—1890); Contribution towards a knowledge of the genus Washingtonia (Bot. Gaz. 44:408–434, figs. 1–12,—1907); Roezl and the type of Washingtonia (Bot. Gaz. 48:462–463,—1909).

1. **W. filifera** Wendl. California Fan Palm. (Fig. 37.) Columnar tree 20 to 75 feet high, the trunk 1 to 3 feet in diameter at the enlarged base, covered with a scaly rind and sometimes clothed quite to the ground with a thatch of dead persistent recurved leaf-bases; leaves fan-shaped, 3 to 6 feet long, with 40 to 60 folds, torn nearly to the middle, the divisions copiously fibrous; petioles 2 to 5 feet long, very stout; flowers borne in a branched panicle on long stems, the whole 8 to 12 feet long; berries borne on pedicels 1 to 1½ lines long, black, oval, 3 to 3½ lines long, with thin flesh surrounding a large seed which is flattened somewhat on the ventral side; endosperm horny.

Westerly and northerly sides of the Colorado Desert, on or above the old beach line of the one-time interior sea, always in moist spots or oases, from near sea-level to 3500 ft.

Locs.—West side of Colorado Desert (south to north): Palm Sprs., 9 mi. e. of Vallecito Sprs. (palms now destroyed, U. S. Geol. Sur. Water-Supply Paper 224:85); Mountain Palm Sprs., a few miles southerly from the preceding sta.; several trees in Hell-hole Cañon, Mt. San Ysidro; Palm Cañon of San Ysidro, the lowest group in the cañon (½ mi. from mouth of gorge) has about 86 large trees and 45 small ones (Dutton & Jepson), the entire cañon said to contain a thousand; Indian Cañon, opening n. into Collins Valley, trees in all the western side-cañons where there is water and also at intervals in upper part of main cañon (Dutton & Jepson); Thousand Palms Cañon, opening into Collins Valley (the number of trees does not justify the name—Wm. Schnoka); Las Coyotas, Coyote Cañon; Seventeen Palms, at southeasterly base of the Santa Rosa Mts. in the Sheep Hills; Dos Palmas, easterly from Piñon Flat, Santa Rosa Mts., 3500 ft. alt.; Palm Cañon of San Jacinto, about 100 trees; Lukens Cañon, 50 or 60 trees; Murray Cañon, about 100 trees; Andreas Cañon, about 35 trees; side cañon of Snow Creek, n. slope Mt. San Jacinto, about 12 trees; 7 mi. further west, cañon with 2 trees, the trees now destroyed (Jepson, Silva Cal. 172).

North side of Colorado Desert (west to east): Whitewater Cañon; Seven Palms (easterly from Palm Sprs. sta.); Willis Palms (F. H. Willis ranch, 4 mi. northeasterly from Edom sta.); Thousand Palms, a very fine assemblage in Thousand Palms Cañon, 4½ mi. northeast of Edom sta.; Hidden Palms, 2 groups in a cañon 1 mi. e. of preceding locality); Pushwalla Palms in Pushwalla Cañon, next east; thence eastward a number of groups along the base of the mountains north of Indio, including the Twelve Apostles group; northerly from Mecca and about 6 mi. southerly from Shaver Well are two small palm groups in cañons; cluster on the alkaline flats near Mecca (Carnegie Publ. 193: 106); Dos Palmas (two palms at a spring 6 mi. e. of Salton sta.); said to occur also in Red Cañon, Chuckawalla Mts. (Parish, Pl. World 17:123), which would be the most easterly locality; Twenty-nine Palms, 40 mi. n. of Mecca, the most northerly locality; 4 mi. e. of Cottonwood Sprs., Cottonwood Mts., about 100 trees in a cañon acc. E. C. Jaeger.

Refs.—Washingtonia filifera Wendl. Bot. Zeit. 37:68 (1879); Jepson, Silva Cal. 172, pls. 6, 55 (1910). Var. *robusta* Parish, Bot. Gaz. 44:420 (1907). *W. robusta* Wendl. Gart. Zeit. 2:198 (1883). Var. *microsperma* Becc. in Parish, l.c. *W. filamentosa* Ktze. Rev. Gen. Pl. 2:737 (1891); Sargent, Silva N. Am. 10:47, pl. 509 (1891). *Neowashingtonia filamentosa* Sudw. U. S. D. A. Div. For. Bull. 14:105 (1891).

ARACEAE. Arum Family.

Perennial glabrous herbs with large leaves, perfect or usually unisexual flowers crowded on a spadix surrounded by a usually colored spathe. Ovary 1 to several-celled, ovules 1 to several in each cell.—Genera 105 and species 900, mostly tropical, a few in the temperate zones.

Bibliog.—Engler, A., Araceae (DC. Monog. Phan. 2:1–681,—1879).

1. LYSICHITON Schott.

Peduncle and basal leaves from a stout rootstock. Flowers perfect, the calyx 4-lobed with 4 stamens opposite the segments. Ovary 2-celled, 1 ovule in each cell; stigma depressed. Fruit a 2-seeded berry sunk in the spadix.—Species 1. (Greek lusis, loose, and chiton, a tunic or covering, referring to the spathe.)

1. **L. kamtschatcensis** Schott. Skunk Cabbage. Coarse herb; leaves yellow, oblong to elliptic, 1 to 1½ feet long and ½ to ¾ feet wide; peduncle stout, shorter than the leaves; flowering spadix about 1 inch long.

Swamps along the coast: Santa Cruz Mts. to Humboldt Co.; north to Alaska and Siberia.

Locs.—Felton, *M. L. Hutchinson;* Ben Lomond, *Geo. J. Streator;* Russian River (Fl. W. Mid. Cal. ed. 2, 87); Ft. Bragg (Bot. Cal. 2:187); Eureka, *Jepson*; Little Van Duzen bridge, acc. *Tracy.* Juneau, Alas., *Jepson* 479.

Refs.—Lysichiton kamtschatcensis Schott, Prod. Aroid. 421 (1860). *Dracontium kamtschatcense* L. Sp. Pl. 2:968 (1753), type loc. Siberia.

LEMNACEAE. Duckweed Family.

Minute floating or submerged aquatic perennials, without leaves. Plant body consisting of a leaf-like stem or "frond" which is densely green, disk-shaped, elongated or irregular. Basal margin of the frond with 1 or 2 clefts or reproductive pouches. Vegetative reproduction active, the daughter fronds arising from the reproductive pouches and attached to the parent frond by slender stalks (or stipes). Inflorescence, when present, consisting of a simple cluster of 2 staminate flowers and 1 pistillate flower, contained in the reproductive pouch, subtended by a sac-like spathe, and imitating a single flower. Staminate flower consisting of a single stamen and the pistillate flower of a single ovary with 1 to 7 ovules. Perianth none. Flowers and fruit scarce, in one genus unknown. The daughter fronds soon separate or remain connected for some time; they may at certain seasons sink to the bottom of the pond or ditch and undergo a resting period.—Genera 4, species about 25, temperate and tropical zones.

Bibliog.—Hegelmaier, Friedr., Systematische Uebersicht der Lemnaceen (Engl. Bot. Jahrb. 21:268–305,—1895). Thompson, C. H., Revision of Am. Lemnaceae (Rep. Mo. Bot. Gard. 9:21–42, pls. 1–4,—1897). McAtee, W. L., Duckweeds [as wild duck foods] (U. S. D. A. Bull. 205:3–5,—1915).

Fronds with roots; vegetative pouches 2, posteriorly placed.
- Frond 5 to 15-nerved, with several roots ..... 1. Spirodela.
- Frond 1 to 5-nerved, with a single root ..... 2. Lemna.

Fronds without roots, thin, strap-shaped; vegetative pouches 1 ..... 3. Wolffiella.

1. SPIRODELA Schleiden.

Fronds with many fascicled roots. Roots with one vascular bundle. Reproductive pouches 2, with cleft-like openings in either margin of the basal portion of the frond. Inflorescence consisting of a cluster of 1 pistillate and 2 staminate flowers borne in the reproductive pouches and subtended by a sac-like spathe. Fruit round-lenticular, with winged margins.—Species about 6, all continents. (Greek speira, a cord, and delos, evident.)

1. **S. polyrhiza** Schleiden. Fronds solitary or in colonies of 2 to 5, roundish obovate, 5 to 15-nerved, 1½ to 4 lines long, usually sterile.

Southern California. Cosmopolitan.

Locs.—San Bernardino (Engl., Bot. Jahrb. 21:284); Pitt River (e. of Hat Creek), *Brewer* 2190.

Refs.—SPIRODELA POLYRHIZA Schleiden, Linnaea 13:392 (1839). *Lemna polyrhiza* L. Sp. Pl. 970 (1753), type European.

2. **LEMNA** L. DUCKWEED.

Fronds disk-shaped, usually with a central nerve and with or without several lateral nerves, each with a single root which is commonly provided with a root cap. Reproductive pouches 2, appearing as clefts in either margin of the basal portion of the frond, each containing a cluster of 3 flowers surrounded by a spathe. Ovary with 1 to 7 ovules. Fruit ribbed.—Species about 8, all continents. (Ancient Greek name.)

Frond with a long stipe, mostly submerged and forming large masses; papillae none..... 3. *L. trisulca.*

Frond with a short stipe, floating on the surface.

Symmetrical or nearly so, papillate along the median line.

Oblong-ovate; fruit more or less lenticular.

Upper surface uniformly green; margin of the fruit without appendages; seed always 1.....2. *L. minor.*

Upper surface mottled with irregular brown streaks; margin of the fruit with rounded wing lobes; seeds 1 to several.....1. *L. gibba.*

Oblong to elliptical, small, green on both surfaces, with a row of papillae along the mid-nerve; fruit elongated.....5. *L. minima.*

Unsymmetrical.

Obliquely obovate, obscurely 3 to 7-nerved, papillate along the median line.....1. *L. gibba.*

Long oblong, thin, obscurely 1-nerved; papillae none.....4. *L. cyclostasa.*

1. **L. gibba** L. GIBBOUS DUCKWEED. Fronds 1 to 4 in a group, commonly 2, orbicular to obovate, slightly to very unsymmetrical, usually 3 to 5-nerved, 1 to 2 lines wide, 1 to 2½ lines long, thick, convex and slightly keeled above, flat to strongly gibbous beneath; base usually acute and commonly with narrow wing margins; pistil clavate; ovules 1 to 7; fruit symmetrical, purple-tinted, winged with rounded lobes at the upper margin on either side of the stigma.

Stagnant ponds. All continents except South America.

Locs.—Pasadena, Compton, Santa Monica Cañon, San Pedro, San Juan Capistrano (Erythea 4:195); Mound City, San Bernardino Valley (Erythea, 7:90); San Francisco (Bot. Cal. 2:190).

Ref.—LEMNA GIBBA L. Sp. Pl. 970 (1753), type European.

2. **L. minor** L. SMALLER DUCKWEED. Fronds solitary or few in a cluster, round to elliptic-obovate, green or purplish beneath, uniformly bright-green above, convex on both sides, upper surface sometimes slightly keeled and with a row of papillae along the mid-nerve, the apical one usually quite prominent; pistil clavate; ovule 1; fruit not winged, projecting about ⅓ beyond the margin of the frond.

Stagnant pools, abundant. All continents except South America.

Loc.—Lobos Creek, San Francisco (Bot. Cal. 2:190).

Ref.—LEMNA MINOR L. Sp. Pl. 970 (1753), type European.

3. **L. trisulca** L. IVY-LEAF DUCKWEED. Fronds forming dense masses, oblong to oblong-lanceolate, slightly unsymmetrical and frequently a little falcate, 2½ to 5 lines long and 1½ lines wide, the long stipe attached to the basal margin; floating fronds with shorter stipes and cavernous throughout the central portion; submerged fronds with long twisted stipes; seed prominently 12 to 15-ribbed.

Cold springs and running water, Sierra Nevada. All continents except South America.

Locs.—Plumas Co. (Bot. Cal. 2:189); Bouldin Isl. (Zoe, 4:217); San Francisco (Bot. Cal. 2:189); San Gabriel Creek, San Gabriel Mts. (Bot. Cal. 2:189).

Ref.—LEMNA TRISULCA L. Sp. Pl. 970 (1753), type European.

4. **L. cyclostasa** Chev. Fronds solitary or more commonly 2 to 8 cohering in a more or less curved chain, thin, oblong to obovate-oblong, usually somewhat falcate, ⅓ to ¾ lines wide by 1 to 1¼ lines long, without papillae; base of the

frond usually unsymmetrical, tapering into a short stipe or frequently sessile; fruit long-ovate, pointed by the long, straight or rarely curved style; seed 12 to 29-ribbed.

Springs and pools. North and South America.

Locs.—Springs at foot of Uncle Sam Mt. (Mt. Konokti), Lake Co., *Bolander* 2662; Santa Cruz (Engler, Jahrb. 21:298).

Refs.—LEMNA CYCLOSTASA Chev. Fl. Par. 2:256 (1827). *L. minor* var. *cyclostasa* Ell. Bot. S. Car. and Ga. 2:518 (1824). *L. valdiviana* Phil. Linnaea 33:239 (1864).

5. **L. minima** Phil. Fronds cohering in 2s, sometimes in 4s, or solitary, oblong to elliptical, symmetrical, ½ to 1¼ lines wide, ¾ to 2 lines long, rather thick, with a row of papillae along the mid-nerve; lower surface flat or slightly convex, upper surface slightly to prominently convex with thin margin entirely around the frond; frond cavernous in the middle portion only, commonly nerveless; seed oblong, pointed, about 16-ribbed.—Two growth stages: smaller fronds straw-yellow or pale green and strikingly convex on the upper surface; larger fronds thinner and green-colored.

Pools, California, east to Wyoming and Florida.

Locs.—San Bernardino (Erythea, 7:90); San Francisco (Engl., Jahrb. 21:299).

Ref.—LEMNA MINIMA Phil. Linnaea, 33:239 (1864), type from Chile.

3. WOLFFIELLA Hglm.

Fronds minute, thin, band-like or ligulate, somewhat curved, rootless. Reproductive pouch one, triangular, opening as a cleft in the basal margin of the frond. Flowers and fruit unknown. Stipe of the daughter frond attached on the margin of the reproductive pouch.—Species about 7, mostly in the tropics. (Diminutive of Wolffia.)

Fronds saber-shaped.....1. *W. oblonga.*
Fronds ligulate.....2. *W. lingulata.*

1. **W. oblonga** Hglm. Fronds solitary or in pairs, rarely 3s, slightly falcate, tapering from the rounded base to the somewhat narrower rounded apex, sometimes oblong, rarely straight, 1½ to 2¼ lines long.

Southern California. Mexico, South America.

Loc.—San Bernardino Valley (acc. Thompson, Rep. Mo. Bot. Gard. 9:39).

Refs.—WOLFFIELLA OBLONGA Hglm. Engler, Bot. Jahrb. 21:303 (1895). *Lemna oblonga* Phillipi, Linnaea, 29:45 (1857), type loc. Santiago, Chile, *Philippi.*

2. **W. lingulata** Hglm. Fronds solitary or in pairs, ovate to oblong-ligulate, 1¼ to 3¼ lines long.

Kern Co.; San Bernardino Valley. Mexico.

Locs.—Kern Co. (acc. Thompson, Rep. Mo. Bot. Gard.—1897); San Bernardino Valley (Erythea 7:90).

Refs.—WOLFFIELLA LINGULATA Hglm. Engler, Bot. Jahrb. 21:303 (1895). *Wolffia lingulata* Hglm. Monog. Lemnae, 132 (1868).

PONTEDERIACEAE. PICKEREL WEED FAMILY

Aquatic herbs. Perianth with a tube, 6-lobed or 6-parted. Stamens 3 or 6, inserted on the throat of the perianth. Ovary superior, 1 or 3-celled.—Genera 5 and species about 24, all continents except Europe, mostly in the tropics and warm temperate regions.

Bibliog.—Solms-Laubach, Pontederiaceae (DC. Monog. Phan. 4:501–535,—1883).

1. HETERANTHERA R. & P.

Ours submerged grass-like herbs, only the flowers reaching the surface. Spathe 1-flowered. Perianth with elongated filiform tube and rotate 6-parted limb; segments linear-lanceolate. Stamens 3. Ovary 1-celled with 3 parietal placentae.—Species 9, North and South America, Africa. (Greek heteros, different, and anthera, anther, the stamens unequal in some species.)

1. **H. dubia** MacM. Leaves linear or ribbon-like, translucent; perianth small, pale yellow, its tube about 4 inches long.

Still water: Mendocino Co. acc. Bot. Cal. 2:187 (1880). Oregon and east to the Atlantic.

Refs.—Heteranthera dubia MacM. Met. Minn. 138 (1892). *Commelina dubia* Jacq. Obs. Bot. 3:9, pl. 59 (1768), type coll. by *Clayton*, undoubtedly in Virginia. *Schollera graminea* Gray, Man. 511 (1848).

Eichornia Kunth. Herbs with rootstock floating or rooting in mud. Petioles wholly or partly inflated, the blades roundish to ovate. Perianth bluish purple. Stamens 6. Ovary 3-celled. E. crassipes Solms. Water Hyacinth. Scapes 4 to 16 in. high; blades 2½ to 3 in. broad.—Introduced from tropical America and locally established as a weed at a few stations.

Locs.—Warm Creek reservoir, San Bernardino, beginning to extend down stream, *Parish* 11648; sloughs and ponds east of Fresno in the foothills acc. *Eugene Heath;* Clarksburg, Yolo Co., *Eleanor W. Smith.* In tropical waters and in Florida the plants multiply vegetatively with rapidity and become a menace, since often obstructing navigation in rivers and rendering lakes and streams unsightly.

Refs.—Eichornia crassipes Solms in DC. Monog. Phan. 4:527 (1883). *Pontederia crassipes* Mart. Nov. Gen. 1:9, t. 4 (1824), type loc. Brazil. *Piaropus crassipes* Britt. Ann. N. Y. Acad. 7:241 (1893).

JUNCACEAE. Rush Family

Annual or perennial herbs. Stems simple, terete or ancipital. Leaves alternate, sheathing, narrow, flat or terete. Flowers lily-like in structure, sedge-like in aspect, small, dry, perfect, disposed in terminal or sometimes apparently lateral heads, spikes, corymbs or panicles. Perianth with 6 distinct similar glume-like segments. Stamens 6 or sometimes 3. Ovary superior, 3 or sometimes 1-celled; stigmas 3, filiform; ovules 3 to many. Fruit a loculicidally 3-valved capsule. Embryo minute, enclosed in fleshy endosperm.—In both the genera Luzula and Juncus, individuals of the same species vary greatly in aspect owing to the tendency of the inflorescence to become either capitately-congested on the one hand or loosely paniculate on the other. The hue of the inflorescence is, however, very constant. The lowest bract of the inflorescence is here termed the involucral bract.—Genera 8, the species about 300, widely dispersed.

Bibliog.—Engelman, Geo., Revision of N. Am. Species of the genus Juncus (Trans. St. Louis Acad. 2:424–498,—1866–1868). Buchenau, F., Monog. Juncaceaeum (Engler, Jahrb. 1:104–141,—1880); Die Verbreitung der Juncaceen uber die Erde (l.c. 12:1–145,—1890); Juncaceae (Engler, Pflzr. 4[36]:1–284, figs. 1–121,—1905). Wiegand, K. M., Juncus tenuis and some of its N. Am. allies (Bull. Torr. Club, 27:511–527,—1900). Parish, S. B., Southern Cal. Juncaceae (Muhl. 6:113–120, 121–128,—1910). Fernald & Wiegand, N. Am. Variations of Juncus effusus (Rhod. 12:81–93,—1910).

Leaves stiff, terete or flat; stems usually with spongy pith; capsule 3 or 1-celled; seeds several to many ..... 1. Juncus.

Leaves soft, flat; stems hollow; capsule 1-celled; seeds 1 to 3 ..... 2. Luzula.

1. JUNCUS L. Rush

Plants of swamps or wet places; herbage glabrous. Stems simple (rarely branching), with spongy pith or sometimes hollow, leafy, or naked and scape-like. Leaves stiff, terete, channeled or flat, the blades arising from sheaths or the sheaths sometimes bladeless. Flowers greenish or brownish. Stamens 6, or when 3 opposite the outer perianth segments. Capsule 3-celled with central placentae or 1-celled with 3 parietal placentae, many-seeded.—Species 207, all continents. (Classical name for the Rush, perhaps from Latin jungo, to join, the stems used for binding.) Sheaths sometimes bearing a ligule at summit.

A. Inflorescence apparently lateral; involucral bract erect, appearing like a continuous prolongation of the stem; leaves all basal, reduced to sheaths or the inner sheaths sometimes blade-bearing and terete; ligules none; stems scape-like; perennials.

Flowers 3 to 9 in head-like clusters, the clusters disposed in a panicle; inner sheaths blade-bearing; stems and blades stout and pungent.

Perianth segments brownish, scariously margined or winged, the inner obovate, emarginate, a line long; capsule subglobose, obtuse ..... 1. *J. acutus.*

Perianth segments greenish, not winged, the inner lanceolate, rarely ovate, acute, 3 lines long; capsule ovate, acute ..... 2. *J. cooperi.*

Flowers inserted singly on the racemose branches of the panicle, distinctly separated to somewhat crowded but never truly capitate; stems usually slender and rigid; sheaths bladeless except nos. 6 and 10.

Flowers many to numerous, in panicles or compound panicles.

Flowers large (2 lines long or more); perianth segments scarious-margined; capsule oblong-ovate.

Flowers dark brown; perianth segments with deep purple margins.....3. *J. leseurii.*

Flowers mostly greenish; perianth segments with whitish margins or only faintly purplish.

Sheaths quite bladeless.

Perianth greenish or dark, the braetlets scarious; common, widely distributed. 4. *J. balticus.*

Perianth and bractlets concolorous; S. Cal.....5. *J. textilis.*

Sheaths bearing scape-like blades.....6. *J. mexicanus.*

Flowers small (less than 1 line long); perianth segments not scarious-margined; capsule obovate or subglobose.

Stamens 6; capsule broadly subglobose, obtuse, apiculate.....7. *J. patens.*

Stamens 3; capsule narrow, clavate, obovate, obtuse or retuse.....8. *J. effusus.*

Flowers few (1 to 3); low alpine plants.

Inner sheaths bristle-tipped; capsule retuse; plants ½ to 1½ feet high..9. *J. drummondii.*

Inner sheaths blade-bearing; capsule acute; plants ½ foot high or less.....10. *J. parryi.*

B. Inflorescence terminal; involucral bract not a continuation of the stem (or if so conspicuously channeled along the upper side).

1. Low dwarf annuals with fibrous roots.

Stamens 6; flowers secund, remote; stems branching from the base; leaves cauline.

Plants 4 to 10 inches high; capsule oblong.....11. *J. bufonius.*

Plants 1½ to 2 inches high; capsule elliptic.....12. *J. sphaerocarpus.*

Stamens 3; flowers in small heads; stems short with several scape-like peduncles; leaves mostly basal; plants 1 to 3 inches high; capsule ovate, apiculate.....13. *J. triformis.*

2. Taller perennials; rootstocks mostly stout and creeping.

a. Leaves not transversely ribbed, usually flat.

Stems naked; flowers solitary in a diffuse (rarely compact) panicle; leaves very fine, with ligules.....14. *J. tenuis.*

Stems more or less leafy; flowers capitate or clustered; leaves flat or grass-like.

Stems low, mostly equaling the leaves; ligules none; styles usually short.

Involucral bract short; heads usually solitary; perianth equaling the capsule; segments brown-margined.....15. *J. falcatus.*

Involucral bract elongated; heads 3 to 6; perianth shorter than the capsule; segments broadly white margined.....16. *J. obtusatus.*

Stems taller, exceeding the leaves; heads 2 to 6 or many; styles long exserted.

Ligules present; leaves narrow.

Anthers red-brown; leaves channeled.....17. *J. canaliculatus.*

Anthers white; leaves flat.....18. *J. longistylis.*

Ligules absent; leaves broad.....19. *J. latifolius.*

b. Leaves transversely ribbed by internal septa.

Leaves narrow, terete or sub-terete, not equitant; ligules and septations conspicuous; stems usually slender.

Early leaves capillary and floating.....20. *J. supiniformis.*

Leaves all erect, not capillary or floating.

Heads large (except. no. 22).

Perianth dark colored.

Heads usually few or solitary; perianth segments moderately pliable.

Very slender mostly low grass-like plants; heads very dark.

Heads solitary, wholly very dark brown; capsule obovate, obtuse; styles included; high montane.....21. *J. mertensianus.*

Heads usually two or more, dark brown with whitish or scarious bractlets at base; capsule oblong, acutish; styles exserted.....22. *J. nevadensis.*

Tall plants with less slender stems; heads densely many-flowered; perianth dark brown; capsule very dark; coast valleys.....23. *J. bolanderi.*

Heads numerous in a dense or capitate cluster; perianth segments lanceolate, light brown, subspineseent or very rigid.....24. *J. torreyi.*

Perianth segments pale and scarious, often obtuse.....25. *J. chlorocephalus.*

Heads small, numerous, in large compound panicles; plants very tall and slender.

Stems slender, smooth.....26. *J. dubius.*

Stems stouter, markedly rugulose.....27. *J. rugulosus.*

Leaves equitant, usually flattened; septations inconspicuous; ligules usually inconspicuous or absent; stems rather stout, ancipital.

Jepson, Flora of California, vol. 1, pp. 193-248, March 17, 1922.

Heads small, numerous, in large compound panicles; perianth segments linear-lanceolate; capsule narrow, attenuate.....28. *J. oxymeris.*
Heads larger, usually few; perianth segments lanceolate; capsule oblong, acute.
Leaves 2 to 4 lines wide; perianth segments light reddish brown; capsule abruptly acuminate, shorter than the perianth.
Stamens 6; valleys and lower altitudes.....29. *J. xiphioides.*
Stamens 3; higher mountains or near the coast northward.....30. *J. ensifolius.*
Leaves ½ to 1½ (or 2) lines wide; perianth segments very dark; capsule long acuminate, equaling the perianth.....31. *J. phaeocephalus.*

1. **J. acutus** L. var. **sphaerocarpus** Engelm. (Fig. 38a, b.) Stems terete or slightly compressed, 2 to 4 feet high, stout, rigid and pungent; paniele compound with unequal branches, usually 3 to 6 inches long, ereet and strict, usually exceeding the involucral bract; secondary bracts long acuminate, equaling or exceeding the flowers; clusters 2 to 4-flowered; perianth segments seariousmargined very broadly at apex, especially the inner, 1 line long, exeeeding the stamens, the outer broadly laneeolate, aeute, the inner obovate and deeply emarginate; capsule subglobose, narrower at base, rounded at summit, apiculate, brown, nearly 2 lines long; seeds acute at each end or slightly caudate, about ½ line long, very finely ribbed.

Along the eoast from San Franeiseo to San Diego, thenee east into the Colorado Desert and south into Lower California.

Locs.—Jamul Valley, San Diego Co., *Palmer* 380; Coahuilla Valley region, *D. P. Barrows*; Santa Catalina Isl., *T. Brandegee*; Oceanside, *Parish* 4400; Oxnard, *Davy* 7836; Indio, *Davy* 7935; w. edge Colorado Desert, *Parish* 6149. Forma *xanthosus* Jepson n. forma, capsule less rounded, yellow.—Thousand Palms Cañon, nw. of Indio, *Jepson* 6041 (type); Chuckawalla Sprs., *Hall* 5978.

Refs.—JUNCUS ACUTUS L. var. SPHAEROCARPUS Engelm. Bot. Wheeler, 376 (1876), type loc. Santa Barbara, *Rothrock*. *J. robustus* Wats. Proc. Am. Acad. 14:302 (1879).

2. **J. cooperi** Engelm. (Fig. 38e.) Similar in habit to J. aeutus but the flowers larger, the perianth segments lanceolate, the outer aeute, the inner mucronate, 2½ to 3 lines long; eapsule ovate, aeute, slightly longer than the perianth, greenish; seeds larger, with broad white appendages at eaeh end, or slightly margined on one side.

Salt marshes and alkaline flats, Colorado and Mohave deserts. East to Nevada.

Locs.—Salt Creek, Death Valley, *Grinnell;* Death Valley, *Jepson* 6943 (Eagle Borax Works), 6881 (Texas Spr.); Saratoga Sprs., Death Valley, *Parish* 10025; Panamint Lake, Inyo Co., *Parish* 10154; Soda Lake, e. Mohave Desert, *Parish* 9874; travertine terraces, Salton Sea, *Parish* 8428; Dos Palmas, Colorado Desert, *Parish* 8382; Carrizo Creek, *T. Brandegee.*

Refs.—JUNCUS COOPERI Engelm. Trans. Acad. St. Louis 2:590 (1868), type loc. region of Camp Cady, e. Mohave Desert, *Cooper*; Coville, Bull. Torr. Club 19:309 (1892); Buch. in Engler, Pflzr. 4^{36}:152, fig. 77 (1906).

3. **J. leseurii** Boland. SALT RUSH. (Fig. 38d, e.) Stems 1 to 3 feet high, stout, ereet, terete; rootstoek stoutish; paniele lateral, lax or compact, manyflowered; flowers eommonly somewhat seeund; perianth segments with green midribs and membranous mostly purplish brown margins, 2 to 3 lines long, outer segments lanceolate-aeuminate, the inner ones a little shorter and sometimes less pointed; capsule oblong or ovoid, mucronate, triangular, shorter than the perianth; seeds ovoid, obtuse, searcely apiculate, smoothish or faintly reticulate, ⅓ to ½ line long.

Salt-marshes or near sand dunes or beaches, Monterey Co. to Humboldt Co. North to Alaska.

Locs.—Eureka, *Tracy* 1190½; Lake Pilarcitos, San Mateo Co., *Davy* 758; Point Lobos, San Francisco, *Davy* 4010; Monterey, *Ferguson* 277. Var. **tracyi** Jepson n. var. Infloreseence densely capitate.—Sand dunes, Eureka, *Tracy* (type).

Refs.—JUNCUS LESEURII Bol. Proc. Cal. Acad. 2:179 (1863), type loc. San Francisco Bay region, *Bolander*; Buch. in Engler, Pflzr. 4^{36}:147, fig. 75 (1906). *J. balticus* Willd. subsp. *pacificus* Engelm. Trans. St. Louis Acad. 2:448 (1866), 490 (1868). *J. breweri* Engelm. Trans. St. Louis Acad. 2:440 (1866), type loc. Monterey, *Brewer* 651, is merely a very slender form. Var. TRACYI Jepson.

4. **J. balticus** Willd. WIRE RUSH. (Fig. 38f, g.) Plants caespitose, grass-like, 1 to 3½ feet high; stems strict, terete or sometimes compressed, mediumly stout, sulcately channeled; panicle lateral, lax, many-flowered, its branches disposed to be secund; perianth segments lanceolate, acuminate, greenish, 1½ to 2½ lines long, sometimes faintly lined with purple inside the white scarious margins; inner segments a little shorter and less pointed or obtuse; capsule equaling or shorter than the perianth, ovoid, acute; seeds shortly oblong-cylindric, obscurely apiculate and faintly striate longitudinally, ¼ to ⅓ line long.

Widely spread throughout California. America, Europe.

Locs.—Gazelle, Shasta Valley, *Goldsmith* 16; Calistoga, *Jepson* 7664; Petaluma, *Davy* 4051; Little Oak, Solano Co., *Jepson*; Montezuma Hills, Solano Co., *Jepson*; Carmel, *Ferguson* 284; Avery Sta., Calaveras Co., *A. L. Grant* 4d; Phoenix Lake, Sonora, *A. L. Grant* 58; Middle Camp, Tuolumne Co., *Jepson* 6454; Bakersfield, *Leckenby;* Tulare Co., *Davy* 2447 (stout, intergrade to *J. textilis* Buch.); Owens Lake, *Jepson* 5116; Afton, Mohave Desert, *Parish* 9862; Barstow, *Jepson* 4798; Mecca, *Parish* 8455; Lytle Creek, San Bernardino, *Parish* 8013. In desert spms. the capsules are usually longer than the perianth.

Var. **montanus** Engelm. Lower, the stems more slender, sometimes flattened; panicle very small.—Montane: Medicine Lake, Mt. Hoffman, *Goldsmith* 31, 34; Carson Pass, *Jepson* 8097; Sonora Pass, *A. L. Grant* 133; Seelys Flats, San Bernardino, *Parish* (very similar to the Goldsmith spms.).

Refs.—JUNCUS BALTICUS Willd. Berlin Mag. 3:298 (1890). type loc. shores of the Baltic Sea at Warnemünde, Germany. Var. MONTANUS Engelm. Trans. St. Louis Acad. 2:441 (1866), type loc. "western plains and mountains" of the U. S.

5. **J. textilis** Buch. INDIAN RUSH. (Fig. 38h, i.) Similar to J. balticus; stems much shorter, 3 to 6 feet high, very finely channeled; panicle with longer branches; bractlets and perianth concolorous mostly; inner perianth segments obtuse.

Southern California.

Locs.—San Fernando Mission, *Parish;* Waterman Cañon, San Bernardino, *Parish* 8012 (this is exactly the same as *Parish* 8013, same station, distributed as *J. lescurii* Bol.); Fallbrook, *Parish;* Coahuilla Valley, *D. P. Barrows;* Catalina Isl. acc. Buchenau.

Refs.—JUNCUS TEXTILIS Buch. Abh. Nat. Ver. Brem. 17:336, t. 6 (1902). *J. lescurii* Bol. var. *elatus* Wats. Bot. Cal. 2:205 (1880), based on spms. from San Gabriel Cañon (*Brewer*) and Los Angeles (*Wood*).

6. **J. mexicanus** Willd. Stems slender, grass-like, usually compressed, often contorted; basal sheaths usually bearing a scapiform blade; panicle small; outer perianth segments narrowly lanceolate; capsule ovate, long-beaked.

Death Valley region and southerly through Southern California to Mexico.

Locs.—Texas Spr., Funeral Mts., *Jepson* 6878; Bloomington, San Bernardino Co., *Parish* 4727.

Refs.—JUNCUS MEXICANUS Willd.; R. & S. Syst. Veg. 7:178 (1829). *J. balticus* var. *mexicanus* Ktze. Revis. Gen. 3²:320 (1898). *J. compressus* H.B.K. Nov. Gen. et Sp. Pl. 1:235 (1815), not Jacq. *J. balticus* f. *mexicanus* Parish, Muhl. 6:119 (1901).—Parish discusses the specific validity of J. mexicanus Willd. and makes a strong argument against it.

7. **J. patens** Mey. COMMON RUSH. (Fig. 39a.) Stems slender, densely tufted, 1½ to 3 feet high, erect, terete; rootstock creeping; sheaths rarely awn-tipped; panicle lateral, lax, many-flowered; perianth 1 line long, pale or brownish, its segments lanceolate or broadly subulate, spreading in fruit; stamens 6; anthers ¼ line long, about ½ as long as the filaments; capsule sub-globose, slightly angled, obtuse, apiculate, a little shorter than the perianth; seeds apiculate with a minute white appendage or none.

A common species, in marshy or springy ground, coastal region from Santa Barbara Co. to Del Norte Co. North to Washington.

Locs.—Mt. Hermon, Santa Cruz Co., *Rowe*; Mill Valley, *Blasdale*; Suisun Marshes, *Jepson*; Wild Horse Cañon, Vaca Mts., *Jepson* 2455; Santa Rosa, *Heller* 5680; Kneeland Prairie, Humboldt Co., *Tracy* 3848.

Refs.—JUNCUS PATENS Mey., Synops. Luzul. 28 (1823), type loc. Monterey, *Haenke*; Buch. in Engler, Pflzr. 4³⁶:131, fig. 71 (1906).

Fig. 38. *a*, JUNCUS ACUTUS L. var. SPHAEROCARPUS Engelm., inflorescence, × 1; *b*, perianth and capsule. × 9. *c*, J. COOPERI Engelm., perianth and capsule, × 6. *d*, J. LESEURII Bolander, inflorescence, × 1; *e*, perianth and capsule, × 5. *f*, J. BALTICUS Willd., inflorescence, × 1; *g*, perianth and capsule, × 8. *h*, *J.* TEXTILIS Buch., inflorescence, × 1; *i*, perianth and capsule, × 7.

Fig. 39. *a*, JUNCUS PATENS Mey., perianth and capsule, × 12. *b*, J. EFFUSUS L., lower portion of plant, × 1; *c*, inflorescence, × 1; *d*, perianth and capsule, × 14. *e*, J. DRUMMONDII Mey., habit, × ¼; *f*, perianth and capsule, × 5; *g*, *seed*, × 15. *h*, J. parryi Engelm., perianth and capsule, × 5.

8. **J. effusus** L. Bog Rush. (Fig. 39b-d.) Similar in habit to J. patens but stamens and perianth segments smaller and not so spreading; stems terete, 2 to 4 feet high; inner sheaths tipped with a short awn; paniele slender, usually diffuse, many-flowered; perianth pale brown, 1 line long, the segments lanceolate, acute, equaling the capsule; capsule obovoid or even broadly clavate, obtuse or retuse, triangular; stamens 3, anthers equaling the filaments; seeds apiculate.

Common in springy spots or bogs, forming very dense or heavy clumps on hillsides or valley flats; Coast Ranges, Sierra Nevada and Southern California; also distributed widely throughout the north temperate regions of both the Old and the New World. Also called Sugar Grass.

Locs.—Santa Ana River, San Bernardino Co., *Parish*; Berkeley, *Jepson* 3072; Angwins, Howell Mt., *Jepson*; Eureka, *Tracy* 2548; La Moine, Sacramento River, *Goldsmith* 11; Sisson, *Jepson* 6156; Middle Camp near Confidence, Tuolumne Co., *Jepson* 6452; Center Camp, Tuolumne Co., *A. L. Grant* 556; Yosemite Valley, *Bolander*. The spms. cited represent the usual stoutish form of the species in California and doubtless answer to the var. pacificus Fern. & Wieg. Rhod. 12:89 (1910). The typical J. effusus L. of Europe does not occur in America acc. Fernald and Wiegand.

Var. **exiguus** Fern. & Wieg. Very slender; sheaths pale; flowers very small, pale.—Yosemite Park; Widow Creek, Mt. Shasta, *Goldsmith* 36. Var. **gracilis** Hook. Culms rigid, wiry; perianth segments with lateral dark-brown bands.—Mt. Sanhedrin and north to British Columbia.

Var. **brunneus** Engelm. Nigger Heads. Panicle usually very short and compact; perianth and capsule dark brown.—Coast form: Eureka, Humboldt Co., *Tracy* 1221; Pt. Benicia, Marin Co., *Michener & Bioletti;* Lobos Creek, San Francisco, *Kellogg*; Palo Alto, *Congdon*; Carmel, *Ferguson* 301.

Refs.—Juncus effusus L. Sp. Pl. 326 (1753), type European. Var. exiguus Fern. & Wieg. Rhod. 12:87 (1910), type loc. Yosemite Valley, *Bolander* 4949. Var. gracilis Hook. Fl. Bor. Am. 2:190 (1840), type loc. "N. W. Coast. Columbia. *Douglas. Dr. Scouler.*" Var. brunneus Engelm. Trans. St. Louis Acad. 2:491 (1868), type loc. salt marshes near San Francisco. Var. *aemulans* Buch. in Engler, Pflzr. 4[36]:136 (1906).

9. **J. drummondii** E. Mey. (Fig. 39e-g.) Densely caespitose; stems slender, terete, 6 to 15 inches high; inner sheaths bristle-tipped; spathe ½ to ¾ ineh long, equaling or exceeding the infloreseenee; perianth segments 3 lines long, with brown margins, laneeolate, acute, the inner a little shorter; capsule brown, oblong, retuse, nearly equaling the perianth; seeds ovate, caudate at both ends, brown.

High montane, 7000 to 9000 feet, Sierra Nevada from Tulare Co. to Siskiyou Co. Northward to Alaska; also in the Rocky Mts.

Locs.—Mineral King (acc. Coville); Lake Ahiguita, Madera Co., *Congdon;* Mono Trail, *Bolander* 5096; Calaveras Big Trees, *Hillebrand* 2337; Sonora Pass, *A. L. Grant* 432; Deadman Creek, Tuolumne Co., *Jepson* 6569; Soda Springs Cañon, Kennedy Lake, *A. L. Grant* 483; Mt. Tallac, *Jepson* 8146; Mt. Shasta, *Brewer* 1383. Orca, Alaska, *Jepson* 450.

Refs.—Juncus drummondii E. Mey. in Ledebour, Fl. Ross. 4:235 (1853), type loc. islands of Karäginsk (*Mertens*) and Unalaska (*Chamisso* and *Eschscholtz*); Buch. in Engler, Pflzr. 4[36]:142, fig. 73 (1906). *J. compressus* var. *subtriflorus* E. Mey. Linnaea, 3:368 (1828), type loc. Unalaska. *J. subtriflorus* Cov. Cont. U. S. Nat. Herb. 4:208 (1893). Var. *humilis* Engelm. Trans. St. Louis Acad. 2:445 (1866), type loc. Mt. Shasta, *Brewer*, is simply a reduced form.

10. **J. parryi** Engelm. (Fig. 39h.) Caespitose; stems filiform, 3 to 6 inches high; inner sheaths leaf-bearing, the leaves sulcate at base, terete above, mueh shorter than the stems; ligules none or obseure; spathe exeeeding the infloreseence, ¾ to 1 ineh long; perianth segments 3 lines long, more or less tinged with brown, lanceolate-aeuminate, or the inner obtuse; capsule oblong or narrowly oblong, acute, about equaling or a little exceeding the perianth; seeds as in J. drummondii.

Thin soil drift or alpine meadowlets on granite slopes, Sierra Nevada, 6000 to 12,500 feet. Northward to British Columbia, east to the Rocky Mts.

Locs.—Mt. Whitney, *Jepson* 1079; Lake Merced, Yosemite Park, *Jepson* 4408; Little Yosemite, *Jepson* 4399; Lambert Dome, *Jepson* 3250; Silver Lake, Lassen Co., *Baker & Nutting*; Soda Springs Cañon, Kennedy Lake, *A. L. Grant* 491; Mt. Tallac, *Jepson* 8146a; Mt. Shasta, *Jepson*; Medicine Lake, Siskiyou Co., *Goldsmith* 35.

Ref.—JUNCUS PARRYI Engelm. Trans. St. Louis Acad. 2:466 (1866), 491 (1868), type loc. Colorado, *Parry* 360.

11. **J. bufonius** L. TOAD RUSH. (Fig. 40a, b.) Stems 1 to 6 (or rarely to 10 or 14) inches high, terete, branching from the base, leafy; leaves narrow, usually revolute and bristleform; inflorescence a dichotomous cyme; flowers solitary and remote to closely secund or even sub-capitate; perianth-segments 1½ to 2½ lines long, long acuminate, greenish with white scarious margins, exceeding the capsule; capsule oblong, obtuse or truncatish.

A common species in wet places or dried up pools, throughout California. Very variable in size and aspect. Widely spread over the whole earth acc. to Buchenau.

Locs.—Coast Ranges: Yreka, *Butler* 8, 792, 874; Shasta, *F. W. Morse;* Mendocino City, *Bolander;* Ft. Bragg, *W. C. Mathews*; Napa Valley, *Jepson*; Vacaville, *Jepson*; Novato, Marin Co., *Jepson* 9057; Carmel, *Ferguson* 292. Sierra Nevada: Jess Valley, Modoc Co., *Jepson* 7953; Jackson, *Hansen* 627a; Table Mt., Tuolumne Co., *Jepson* 6425; Yosemite, *Jepson* 8368. Southern California: Victorville, *Parish* 10572; Bear Valley, San Bernardino Mts., *Parish;* Strawberry Valley, Mt. San Jacinto, *Hall* 2076; La Mesa, San Diego Co., *Jepson* 6691.

Var. **halophilus** Fern. & Buch. Stems stout, short; inner perianth segments obtuse, little if at all exceeding the capsule.—Santa Cruz Isl. acc. Parish (Muhl. 6:117).

Refs.—JUNCUS BUFONIUS L. Sp. Pl. 328 (1753), type European. Var. HALOPHILUS Fern. & Buch. Rhod. 6:39 (1904), type loc. Quebec.

12. **J. sphaerocarpus** Nees. Very similar to J. bufonius but smaller; stems densely tufted, 1½ to 2 inches high; branches 2 to 4-flowered; perianth segments subequal, equaling or exceeding the perianth; capsule elliptic or "globose."

Moist flats in the valleys or mountains. California east to Arizona and north to Idaho. Rarely collected with us.

Locs.—Shackelford Creek, w. Siskiyou Co., *Butler* 1742; Antioch, *Davy* 948; Bear Valley, San Bernardino Mts., *Parish.*

Ref.—JUNCUS SPHAEROCARPUS Nees, Flora 1:521 (1818).

13. **J. triformis** Engelm. DWARF RUSH. (Fig. 40c.) Stem almost none, bearing several erect filiform scape-like peduncles 2 to 4 inches high; leaves an inch or less long, filiform; flowers usually 3 to 7 in a small head; perianth brownish, 1 to 1½ lines long; segments narrowly lanceolate, acuminate, nearly equal, a little exceeding the 3 stamens and the capsule; capsule obovate, obtuse, apiculate; style exserted with elongated stigmas.

Mountains, 200 to 6200 feet, North Coast Ranges and Sierra Nevada. Infrequent or overlooked. North to Oregon and Washington.

Locs.—Ft. Seward, Humboldt Co., *Tracy* 4431; Lakeport, Lake Co., *Mary K. Curran;* Chowchilla River bed, *Congdon*; North Fork Kings River, *Hall & Chandler* 558. Var. **stylosus** Engelm. (Fig. 40d.) Styles very long.—DeLong's Ranch, Yosemite trail, *Bolander* 4864; Chowchilla River, Mariposa Co., *Congdon*; Lake Merced, Yosemite Park, *Jepson* 4414. Var. **brachystilus** Engelm. (Fig. 40c.) Styles short.—California north to Washington.—Ukiah, *Bolander* 4646; Howell Mt., *Tracy* 1555, 1534a. Var. **uniflorus** Engelm. (Fig. 40f, g.) Plants very small (¾ to 1 inch high); scapes 1-flowered.—Alt. 20 to 6000 feet.—Campo, San Diego Co., *Parish* 10815; Surprise Lake, Mt. San Jacinto, *Reed* 2481; Bear Valley, *Parish* 1859; Vacaville, *Jepson* 1205; Long Valley, Mendocino Co., *Bolander* 4691; Buck Mt. acc. Tracy.

Refs.—JUNCUS TRIFORMIS Engelm. Trans. St. Louis Acad. 2:488 (1868) and 492 (1868), type from California. Var. STYLOSUS Engelm. l.c. 492, type loc. Yosemite Valley, *Bolander.* Var. BRACHYSTILUS Engelm. l.c. 493, type loc. Ukiah, *Bolander*; Buch. in Engler, Pflzr. 43c:258, fig. 119 A–L (1906). Var. UNIFLORUS Engelm. l.c. 493, based on spms. by *Hillebrand* (Sierra Nevada) and *Bolander* (upper Tuolumne River and Anderson Valley). *J. triformis* var. *brachystilus* f. *uniflorus* Buch. l.c. fig. 119 M–Q. *J. saginoides* Engelm. l.c. 493. *J. uncialis* Greene, Pitt. 2:105 (1890), type loc. Suisun, *Greene;* Buch. l.c. fig. 120 (1906).

14. **J. tenuis** Willd. (Fig. 41a, b.) Stems caespitose, slender, erect, 1 to 2 feet high, leafy at base; leaves very fine, shorter than the stem; involucral bract exceeding the loose panicle; perianth segments pale, narrowly lanceolate, acuminate, 1¾ to 2 lines long, spreading in fruit and equaling or usually exceeding the ovate retuse greenish capsule; seeds with a white appendage at each end.

Dry valley flats, 50 to 4200 feet. Southern California north to Oregon. A common species throughout the United States and western Europe.

Fig. 40. *a*, JUNCUS BUFONIUS L., habit, × 1; *b*, perianth and capsule, × 9. *c*, J. TRIFORMIS Engelm.; habit, ×1. *d*, var. STYLOSUS Engelm., perianth and capsule, × 9. *e*, var. BRACHYSTILUS Engelm., perianth and capsule, × 9. *f*, var. UNIFLORUS Engelm., habit, × 1; *g*, perianth and capsule, × 10.

Fig. 41. *a*, JUNCUS TENUIS Willd., inflorescence, × 1; *b*, perianth and capsule, × 7. *c*, J. FALCATUS E. Mey., habit, × ½; *d*, inflorescence, × 1; *e*, perianth and capsule, × 6.

Locs.—Monterey, *Brewer* 611; Cannon, Solano Co., *Jepson* 6786; Conn Valley, *Jepson* 40a; Anderson Valley, *Bolander* 4809; Eureka, *Tracy* 3749, 3986; Shackelford Creek, w. Siskiyou Co., *Butler* 1697; Shasta Valley, *Butler* 1422; Soulsbyville, *Jepson* 7685; Yosemite Valley, *Jepson* 4392, 8364.

Var. **congestus** Engelm. Inflorescence congested or subcapitate.—Central California coast and middle altitudes in the Sierra Nevada: Eureka, *Tracy* 1172; Hopland, *Jepson* 7626; Santa Rosa, *Heller* 5634; upper Conn Valley, *Jepson* 40b; Alderney, Marin Co., *Jepson* 8269; Carmel, *Ferguson* 296; West Berkeley, *Davy* 748; Yosemite, *Bolander* 6037; Confidence, Tuolumne Co., *Jepson* 7699.

Refs.—JUNCUS TENUIS Willd. Sp. Pl. 2:214 (1799), type loc. Boreal America. Var. CONGESTUS Engelm. Trans. St. Louis Acad. 2:450 (1866), based on spms. from San Francisco (*Bolander*), Monterey (*Brewer*), and Colorado (*Hall*). *J. tenuis* var. *occidentalis* Cov. Proc. Biol. Soc. Wash. 10:129 (1896). *J. occidentalis* Wiegand, Bull. Torr. Club, 27:521 (1900).

15. **J. falcatus** Mey. (Fig. 41c-e.) Stems subterete or a little compressed, 6 to 9 inches high, more or less leafy, terete; rootstock slender, creeping; leaves usually equaling or exceeding the stems, 1½ lines wide, not ribbed by transverse septa; flowers in dense many-flowered terminal heads, the heads usually solitary; involucral bract about equaling the inflorescence; perianth segments 2 lines long, roughened, dark brown, with a broad green midvein; capsule triangularly ovate, obtuse, mucronate; seeds large (½ line long), with a whitish or as if membranous coat.

Coast region, in sand-dunes or sandy soil, from Monterey Co. to Humboldt Co. North to Alaska; Japan, Australia.

Locs.—Santa Cruz Mts., *Brewer* 1581; Lone Mt., San Francisco, *Bolander;* Samoa sand-dunes near Eureka, *Tracy* 1273. Unalaska, *Jepson* 226.

Refs.—JUNCUS FALCATUS Mey. Syn. 34 (1823), type loc. Monterey, *Haenke.* Var. PANICULATUS Engelm. Trans. St. Louis Acad. 2:495 (1868), type loc. Mendocino, *Bolander*; heads smaller, in a panicle. *J. covillei* Piper, Contr. U. S. Nat. Herb. 11:182 (1906).

16. **J. obtusatus** Engelm. (Fig. 42a-c.) Stems subterete or a little compressed, 4 to 10 inches high, from a creeping rootstock, a little surpassing or about equaling the narrow (1 line broad) leaves; sheaths without ligules; involucral bract exceeding the inflorescence; heads 3 to 5-flowered, few in a simple panicle; perianth segments 1½ to 2 lines long, of equal length, the outer ovate, acute, brown margined, the inner very obtuse, white-scarious margined, shorter than the capsule; capsule oblong-ovate, obtuse or truncate, shortly apiculate.

Sandy banks of mountain streams, North Coast Ranges, 200 to 4000 feet; Sierra Nevada, 4000 to 9600 feet (reported only from the central region); San Bernardino Mts. North to Washington.

Locs.—Hydesville, Humboldt Co., *Tracy* 2122; Dinsmore Ranch, Buck Mt., *Tracy* 2871; Buck Mt., Humboldt Co., *Tracy* 3915; Grouse Creek, Humboldt Co., *Chesnut & Drew*; Thistle Sprs., Mt. Sanhedrin, *Heller* 5994; Lake Co., *A. B. Simonds*; Sonora Pass, *A. L. Grant* 346; Kennedy Mdw., Tuolumne Co., *A. L. Grant* 448a; Big Creek, Big Oak Flat road to Yosemite, *Jepson* 8346; San Bernardino Mts. (acc. Parish, Pl. World 20:178).

Refs.—JUNCUS OBTUSATUS Engelm. Trans. St. Louis Acad. 2:495 (1868), type loc. Mariposa Big Trees, *Bolander*; Buch. in Engler, Pflzr. 4[36]:246, fig. 115 (1906).

17. **J. canaliculatus** Engelm. Stems stout, terete, 2 to 3⅓ feet high; herbage pale; leaves concave or channeled, almost equaling the stem; ligules present; panicle open, with 8 to 30 heads; heads 3 to 8 (or 12)-flowered; perianth light greenish red, 2½ lines long, the inner segments distinctly longer; anthers red-brown; style long, the stigmas long exserted; capsule ovate, beaked.

Stony stream banks or damp soil, from the foothills to 7500 feet, cismontane Southern California, and desert slope of the San Bernardino Mts. Arizona, Lower California.

Locs.—Claremont, acc. Parish; Twin Creek Falls, San Bernardino, *Parish* 3962; Little Bear Valley, acc. Parish; Witch Creek, acc. Parish.

Refs.—JUNCUS CANALICULATUS Engelm. Bot. Gaz. 7:6 (1882), type loc. Mill Creek Cañon, San Bernardino Mts., 4000 feet, *S. B. & W. F. Parish* 1095; Parish, Muhl. 6:125 (1910). *J. macrophyllus* Cov.; Hall, Univ. Cal. Publ. Bot. 1:65 (1902).

18. **J. longistylis** Torr. Stems tall (1 to 2 feet high), subterete or slightly compressed; leaves shorter than the stems, the sheaths with ligules; heads densely

(usually 2 to 6)-flowered in a short sparingly branched panicle, exceeding the very short involucral bract; perianth pale, segments of equal length, narrow, acuminate, broadly scarious-margined, 2 lines long; styles long; capsule equaling the perianth, triangular ovate, obtuse, mucronate.

Crest and eastern side of the Sierra Nevada from Mariposa Co. north. New Mexico, Colorado and Nebraska north to Saskatchewan.

Locs.—Mono Lake, *Bolander* 6029; Kennedy Mdw., Tuolumne Co., *A. L. Grant* 125, 448a; Sonora Pass, *A. L. Grant* 272; ne. Modoc Co., *Manning* 441.

Ref.—JUNCUS LONGISTYLIS Torr. Bot. Mex. Bound. 223 (1859), type loc. "Copper Mines," New Mexico, *Bigelow*.

19. **J. latifolius** Buch. (Fig. 42d, e.) Similar to J. longistylis; leaves narrowly linear-lanceolate, 2 to 3½ lines broad, 2 to 5 inches long; ligules absent; heads 6 to 10-flowered, in a loose simple few-headed panicle.

Sierra Nevada from Tulare Co. north to Siskiyou Co.; also Oregon and Washington. More ample material may show that this is better disposed as a variety of J. longistylis.

Locs.—Yosemite Valley, *Bolander* 6035; Sonora Pass, *A. L. Grant* 272; Tallac, *Jepson* 8081; Pilgrim Creek, McCloud Flat, *Goldsmith* 1; Medicine Lake, *Goldsmith* 30; Goosenest foothills, *Butler* 872 (leaves very narrow).

Refs.—JUNCUS LATIFOLIUS Buch. Monogr. Juncae. 425 (1890). *J. longistylis* var. *latifolius* Engelm. Trans. St. Louis Acad. 496 (1868), based on spms. by Bolander from Yosemite Valley (6035), upper Tuolumne River, and east slope of the Sierra Nevada. *J. orthophyllus* Cov. Contrib. U. S. Nat. Herb. 4:207 (1893).

20. **J. supiniformis** Engelm. Early leaves elongated and capillary, floating, pale green, 1 to 2 feet long; stems low, erect, terete, shorter than the subterete cauline leaves; panicle simple, its 3 to 6 small heads about 5-flowered; perianth segments brownish, narrowly lanceolate, acute, nerved, 1½ to 2 lines long.

In ponds, Mendocino and Humboldt cos. North to Washington.

Ecolog. Note.—"In spring these ponds [at Mendocino City] are completely covered with the pale green capillary leaves of this species, 1 or 2 feet long. As the water recedes with the advancing dry season, the erect flowering stems begin to form, and a little later the vestiges of the decayed vernal leaves cover the remaining mud with grayish spiderweb-like filaments."—H. N. Bolander.

Locs.—Mendocino coastal plain, *Bolander* 4767b; Humboldt Co. (acc. Buchenau in Engler, Pflzr. 4[36]:174).

Ref.—JUNCUS SUPINIFORMIS Engelm. Trans. St. Louis Acad. 2:461 (1868), type loc. Mendocino City, *Bolander* 4767.

21. **J. mertensianus** Bong. (Fig. 42f, g.) Stems very slender, compressed, from slender matted rootstocks, 3 to 6 (or 11) inches high; leaves very narrow, rather flattened, less than 1 line wide, finely but obscurely ribbed by transverse septa, the sheaths with ligules; heads solitary, densely many-flowered, dark brown; perianth 1 to 1½ lines long, the lanceolate narrowly acuminate segments equaling the obtuse obovoid capsule; anthers usually shorter than the filaments; seeds obliquely obovate, apiculate at apex, stipitate at base.

Higher mountains, 4000 to 11,000 feet: San Bernardino Mts.; Sierra Nevada north to Modoc Co., thence west to Del Norte Co. North to Alaska and east to Colorado.

Locs.—Mill Creek Falls, San Bernardino Mts., *Parish* 2522; Mt. Silliman, *Ralph Hopping* 425; Mono Pass, *Bolander* 6039; Herring Creek, Tuolumne Co., *A. L. Grant* 108; Heather Lake, El Dorado Co., *Jepson* 8169; Sonora Pass, *A. L. Grant* 310, 418; ne. Modoc Co., *Manning* 466; Ash Creek, Mt. Shasta, *M. S. Baker*; Lake Earle, Del Norte Co., *Davy*. Unalaska, *Jepson* 92, 176.

Refs.—JUNCUS MERTENSIANUS Bong. Mem. St. Petersb. ser. 6, 2:167 (1833), type loc. Sitka, Alaska, *Mertens*; Buch. in Engler, Pflzr. 4[36]:201, fig. 96 (1906).

22. **J. nevadensis** Wats. (Fig. 43a-c.) Resembling slender forms of J. phaeocephalus; stems very slender, somewhat compressed, from a slender creeping

Fig. 42. *a*, JUNCUS OBTUSATUS Engelm., habit, × 1; *b*, inflorescence, × 1; *c*, perianth and capsule, × 6. *d*, J. LATIFOLIUS Buch., inflorescence, × 1; *e*, perianth and capsule, × 6. *f*, J. MERTENSIANUS Mey., habit, × 1; *g*, perianth and capsule, × 9.

Fig. 43. *a*, JUNCUS NEVADENSIS Wats., habit, × ½; *b*, detail of leaf with ligule, × 3; *c*, perianth and capsule, × 6. *d*, J. BOLANDERI Engelm., inflorescence, × 1; *e*, perianth and capsule, × 10. *f*, J. TORREYI Cov., inflorescence, × 1; *g*, perianth and capsule, × 5. *h*, J. CHLOROCEPHALUS Engelm., inflorescence, × 1; *i*, perianth and capsule, × 5.

rootstock, ½ to 1 (or sometimes 2) feet high; leaves teretish, very narrow (¼ to ½, rarely 1 line), more or less distinctly knotted by internal transverse partitions; ligules present; heads small, 2 to 7 in a short open panicle, sparsely flowered; perianth segments very dark brown, lanceolate, acuminate, 1½ to 2 lines long; anthers longer than the filaments; stigmas long exserted; capsule oblong, abruptly acute and beaked, nearly equaling the perianth.

Higher mountains, 5000 to 9000 feet: Sierra Nevada; south to the San Jacinto and San Bernardino mountains. North to British Columbia. Marked by its very narrow and erect strongly septate leaves with prominent ligules.

Locs.—Round Valley, Mt. San Jacinto, *Charlotte M. Wilder* 924; Bear Valley, San Bernardino Mts., *Parish* 3788; Volcano Creek, upper Kern River, *Hall & Babcock* 5425; Tuolumne Soda Sprs., *Bolander* 5062; Yosemite trail, *Bolander* 6041; Eagle Peak Mdws., Yosemite, *Jepson* 4375; Stanislaus Peak, *A. L. Grant* 527; Tahoe, *Jepson* 7736; Sierra Valley, *Hall & Babcock* 4477; Honey Lake Valley, *Davy* 3279; Dixie Valley, Lassen Co., *Baker & Nutting;* Willow Creek, Modoc Co., *Baker & Nutting*; Joseph Creek, Warner Mts., *Smith* 110; Medicine Lake, *Goldsmith* 35a (det. Coville). Brockway, Lake Tahoe, Nev., *Jepson* 7750.

Refs.—JUNCUS NEVADENSIS Wats. Proc. Amer. Acad. 14:303 (1879); Buch. in Engler, Pflzr. 4^{36}:203, fig. 97 (1906). *J. phaeocephalus* var. *gracilis* Engelm. Trans. St. Louis Acad. 2:209 (1868), based on spms. from the Mariposa Grove (*Bolander, Hillebrand*), upper Tuolumne River (*Brewer* 1709, 1760, 2339, *Bolander* 5062), and Mono Pass, *Bolander* 6013. *J. aseptus* Engelm.; Parish, Muhl. 6:123 (1910), type loc. Bear Valley, San Bernardino Mts., *Parish* 1439.

23. **J. bolanderi** Engelm. (Fig. 43d, e.) Stems slender, terete, 1 to 2¾ feet high, a little exceeding or about equaling the terete strongly septate leaves; ligules of the sheaths conspicuous; heads subglobose, very dark, usually 2 or 3 in a close cluster, very many flowered; perianth segments reddish brown, narrowly lanceolate, acuminate and setaceous, 1½ lines long, exceeding the capsule; capsule clavate-oblong, obtuse, apiculate; seeds obovate, apiculate at each end.

Swamps, North Coast Ranges. North to southwestern Oregon.

Locs.—Crescent City, *Davy* 5942; Humboldt Co. (acc. Buchenau in Engler, Pflzr. 4^{36}:186); Comptche, *Harriet Walker* 348; Ft. Bragg, *W. C. Mathews* 211; Ukiah, *Heller* 5837; Elk Mt., n. Lake Co., *Tracy* 2284; *Asti*, Sonoma Co., *Jepson* 7648; Glen Ellen, Sonoma Co., *Bioletti.*

Var. **riparius** Jepson n. var. Heads smaller, lighter-colored, 5 to 9 in a loose panicle; perianth segments less setaceous.—Lower Sacramento River near Rio Vista, *Jepson* 29a.

Refs.—JUNCUS BOLANDERI Engelm. Trans. St. Louis Acad. 2:436 (1866), 470 (1868), type loc. Mendocino City, *Bolander.* Var. RIPARIUS Jepson.

24. **J. torreyi** Cov. (Fig. 43f, g.) Tall coarse plants with slender creeping rootstocks; stems stout, terete, 1¼ to 2 feet or more high; leaves terete, straight and rigidly spreading, the transverse septa very distinct; ligules present; inflorescence terminal; flowers many in large dense heads which form a compact capitate cluster or condensed panicle, the cluster subtended by a long pointed sheath; perianth light brown, 4 to 5 lines long, its segments lanceolate-subulate, exceeding the narrow pointed golden capsule.

Damp places, Southern California. East to Texas, thence far east to the Atlantic and north to British Columbia. Well distinguished by its large dense heads, by its very narrow and rigid perianth segments and by its slender golden capsule.

Locs.—Los Angeles River, *Braunton* 559; Orange, *S. B. & W. F. Parish* 1593; San Bernardino Valley, *Parish* 7153; Dixieland, Imperial Valley, *Parish* 9039; Mecca, *Parish* 8619; Silver Cañon, White Mts., *Jepson* 7418; Bakersfield (acc. Coville).

Refs.—JUNCUS TORREYI Cov. Bull. Torr. Club 22:303 (1895). *J. nodosus* L. var. *megacephalus* Torr. Fl. N. Y. 2:326 (1843), type loc. shores of Lake Ontario, *Gray;* Cov. U. S. Nat. Herb. 4:207 (1893). *J. megacephalus* Wood, Classbook Bot. ed. 2:724 (1861), not Curtis.

25. **J. chlorocephalus** Engelm. (Fig. 43h, i.) Stems low and slender (8 to 15 inches high), terete, from a slender rootstock; leaves narrow (less than a line wide), the sheaths with ligules; heads 1 or 2, many flowered; perianth pale and

scarious; segments 2 lines long, obtuse or acute; style exserted; capsule shorter than the perianth.

Sierra Nevada, 6400 to 8400 feet, from Nevada Co. to Mariposa Co.

Locs.—Donner Pass, *Heller* 7178; Fallen Leaf, El Dorado Co., *Hall* 8776; Eagle Mdw., Tuolumne Co., *A. L. Grant* 378; Cascade Creek, upper Stanislaus River, *Jepson* 6530; Kennedy Lake, *A. L. Grant* 205; Lake Tenaya, Yosemite, *Hall* 3636; Yosemite Falls, *Bolander;* Little Yosemite, *Jepson* 3161.

Ref.—JUNCUS CHLOROCEPHALUS Engelm. Trans. St. Louis Acad. 2:485 (1868), type loc. "higher mts. of California" (=Sierra Nevada), *Hillebrand* 2338.

26. **J. dubius** Engelm. (Fig. 44a-c.) Stems very slender, compressed, 2 to 4 feet high, from stout horizontal rootstocks; leaves narrow (1 line broad) but rigid, ⅔ to nearly as long as the stems, coarsely septate; panicle compound, diffuse, 3 to 12 inches long; heads 6 to 20-flowered, numerous; perianth brown or brownish, 1½ to 2 lines long, the segments lanceolate, acuminate; anthers elongated, rather exceeding the filaments; capsule narrowly oblong, acuminate, slightly longer than the perianth; seeds abruptly apiculate at each end, reticulate, brownish.

Mariposa Co. to Sierra Co. The leaves suggest diminutive bamboo fishing rods.

Locs.—Yosemite Valley, *Jepson* 100a; Sierra Valley, *Jepson* 8043. A local and little known species, known to us in typical form only from Mariposa and Sierra cos. but probably occurring elsewhere in the Sierra Nevada, especially southward. It is similar in aspect to J. oxymeris but the leaves are narrow and compressed, very strongly or even coarsely septate, and the sheaths are ligulate. The following do not have the leaves coarsely septate nor as rigid as in the type, but agree otherwise: Hetch-Hetchy, *Jepson* 3416; Middle Camp, Tuolumne Co., *A. L. Grant* 4 (det. Coville); Yankee Hill, Columbia, *Jepson* 6453.

Ref.—JUNCUS DUBIUS Engelm. Trans. St. Louis Acad. 2:459 (1868), type loc. Mariposa Big Trees, *Bolander* 6032.

27. **J. rugulosus** Engelm. (Fig. 44d, e.) Very closely allied in habit and character to J. dubius; stems stouter, 1½ to 3 feet high, sharply and minutely transverse-rugulose; leaves strongly septate, attenuate into a flagellate-filiform tip; panicle 4 to 9 inches long; heads small, 4 to 6-flowered; perianth 1¼ to 1½ lines long, its segments oblong-lanceolate, acuminate; filaments 1½ to 2 times as long as the anthers; capsule oblong and acuminate, or lanceolate or broadly subulate, prismatically and sharply triangular, slightly exceeding the perianth.

Damp meadow land or marshes, southern Mohave Desert through the valleys of cismontane Southern California to San Diego. This differs from J. dubius, aside from the wrinkled epidermis, only in the relative length of the anthers which is not an absolute character.

Locs.—Victorville, *Parish* 10564; Lone Pine Cañon, n. slope San Gabriel Mts., *Abrams & McGregor* 686; San Bernardino Valley, *Parish* 6947; Los Angeles River, *Braunton*; Long Beach, *E. Bethel*; Balona Ranch, San Diego Co., *S. B. & W. F. Parish* 1416.

Ref.—JUNCUS RUGULOSUS Engelm. Bot. Gaz. 6:224 (1881), type loc. south foot of San Bernardino Mts., *W. G. Wright.*

28. **J. oxymeris** Engelm. Stems 1 to 2 feet high, compressed, somewhat angled, erect, from an elongated horizontal rootstock, often stoloniferous; leaves broad and flat, equitant (1½ or) 2 to 3 lines wide, ligules not present, transverse partitions not conspicuous; involucral bract short; heads 5 to 10-flowered, set singly in a loose panicle; perianth segments brownish, linear-lanceolate, subulate, of equal length or the interior slightly longer; anthers 6, longer than the filaments; styles long exserted; capsule long attenuate, exceeding the perianth; seeds small, obovate, apiculate, light brown and finely reticulate.

Moist valleys and mountain flats, Coast Ranges and Sierra Nevada, 50 to 6000 feet. North to Oregon.

Locs.—Scott Valley, Lake Co., *Tracy* 2381; lower Sacramento River near Rio Vista, *Jepson* 30a; Confidence, Tuolumne Co., *Jepson* 7701; Mariposa Big Trees, *Bolander* 6031.

Ref.—JUNCUS OXYMERIS Engelm. Trans. St. Louis Acad. 2:483 (1868), type loc. Sacramento Valley, *Hartweg* 322.

Fig. 44. *a*, JUNCUS DUBIUS Engelm., detail of leaf with ligule, × 1; *b*, inflorescence, × 1; *c*, perianth and capsule, × 8. *d*, J. RUGULOSUS Engelm., detail of stem, × 8; *e*, perianth and capsule, × 8. *f*, J. XIPHIOIDES E. Mey., inflorescence, × 1; *g*, perianth and capsule, × 8. *h*, J. PHAEOCEPHALUS Engelm., inflorescence, × 1; *i*, perianth and capsule, × 8. *j*, var. PANICULATUS Engelm., inflorescence, × 1; *k*, perianth and capsule, × 7.

29. **J. xiphioides** Mey. (Fig. 44 f, g.) Stems ancipital, 1½ to 3 feet high; leaves equitant, more or less obviously septate, 1½ to 2½ lines wide, 6 to 14 inches long; panicle 2½ to 7 inches long; heads 6 to 11-flowered, discrete or more or less congested; perianth segments lanceolate, subulate-acuminate, the inner a little shorter than the outer; stamens 6; stigmas barely exserted; capsule narrowly cylindric, abruptly acute or somewhat beaked, equaling or exceeding the perianth; seeds narrowly ovoid, apiculate.

Coastal region, salt marshes and moist lands. Southern California to Humboldt Co. and north to Oregon.

Locs.—Malibu Cañon, Los Angeles Co., *Barber*; Victorville, *Parish* 10568; East Oakland, *Harriet Walker* 660 (infl. congested); Berkeley, *Jepson* 8188; Stege, *Davy* 4076; Laribee Creek, Humboldt Co., *Tracy* 4671; North Fork Eel River near north border Mendocino Co., *Goddard* 636; Honey Lake Valley, *Jepson* 7794.

Var. **auratus** Engelm. Stems slender, lower; heads yellow.—Central California: Suisun marshes, *Jepson* 3a; Mt. Diablo, *Brewer* 838; Saratoga, *Davy* 293 (transition to species).

Refs.—JUNCUS XIPHIOIDES Mey. Syn. Jun. 50 (1823), type loc. Monterey, *Haenke*. Var. *littoralis* Engelm. Trans. St. Louis Acad. 2:481 (1868), the typical coast form. Var. AURATUS Engelm. l.c., type loc. Mt. Diablo, *Brewer*.

30. **J. ensifolius** Wikstr. Similar to J. xiphioides; stems 1 to 2 feet high; heads fewer, dense, dark-colored, many-flowered, 3 to 4 lines broad; perianth larger, dark brown, equaling the acute capsule; stamens mostly 3 (sometimes 6).

Wet granitic gravel, Sierra Nevada, 4000 to 9600 feet, north to Siskiyou Co., thence southwesterly to Mendocino Co. Far north to Alaska.

Locs.—Merced Big Trees, *Hall & Babcock* 3415; Kennedy Mdws., Tuolumne Co., *A. L. Grant* 116; Soda Springs Cañon, Kennedy Lake, Tuolumne Co., *A. L. Grant* 475, 480; Sonora Pass, *A. L. Grant* 145; Strawberry, Tuolumne Co., *Jepson* 6504; Eagle Lake, *Baker & Nutting*; Jess Valley, Modoc Co., *Jepson* 7954, 7985; Oro Fino, Siskiyou Co., *Butler* 1784; Quartz Valley, Siskiyou Co., *Butler* 1832; White Thorn Valley, s. Humboldt Co., *Tracy* 5027; Ft. Bragg, *W. C. Mathews* 156, 160. Unalaska, *Jepson* 276.

Refs.—JUNCUS ENSIFOLIUS Wikstr. Vet. Akad. Handl. Stockh. 2:274 (1823), type loc. Unalaska. *J. xiphioides* var. *triandrus* Engelm. Trans. St. Louis Acad. 2:481 (1868), type loc. Yosemite Valley, *Bolander* 6026.

31. **J. phaeocephalus** Engelm. (Fig. 44h, i.) Stems ⅔ to 1½ feet high, erect, leafy, ancipitally compressed, not winged, arising from stout elongated rootstocks; leaves ½ to 1½ lines wide, compressed, equitant, ribbed by transverse septa, sometimes very distinctly so; ligules none; flowers in terminal heads, the inflorescence usually barely exceeding the leaves; heads 1 to 3, solitary or 2 in a place; perianth dark brown, 1½ to 2 lines long; style long; stigmas exserted; capsule long acuminate, equaling or slightly exceeding the perianth; seeds ovoid, the longitudinal ridges connected by similar transverse ones.

Meadows and borders of swamps, coast region from Los Angeles Co. to Mendocino Co. and north to Oregon.

Locs.—Los Angeles, *Hasse*; Carmel, *Ferguson* 291; Pajaro hills, *Chandler*; Lake Pilarcitos, San Mateo Co., *Davy* 756; Belmont, *Davy* 751; Lone Mt., San Francisco, *Kellogg*; Peralta Park, Berkeley, *Davy*.

Var. **paniculatus** Engelm. (Fig. 44j, k.) Stems 1 to 3 feet high from a stout rootstock; heads few-flowered, many to numerous in a loose compound panicle; perianth segments very dark; styles long-exserted.—Valleys and mountain flats, Coast Ranges, Sierra Nevada, and cismontane Southern California.

Locs.—Tauquitz Valley, Mt. San Jacinto, *Jepson* 2311; San Bernardino Valley, *Parish* 2029; South Fork Santa Ana River, *Hall* 7609; Huckleberry Mdw., Kaweah River basin, *Hopping* 416; Warm Springs, Alameda Co., *Jepson* 100b; Alviso, *Elmer*; Berkeley, *Davy* 753; Alderney, Marin Co., *Jepson* 8266; Vacaville, *Jepson* 4244 (det. F. V. C.).

Refs.—JUNCUS PHAEOCEPHALUS Engelm. Trans. St. Louis Acad. 2:484 (1868), type loc. central California sea-coast; Buch. in Engler, Pflzr. 4[36]:178, fig. 88 (1906). Var. *glomeratus* Engelm. l.c. the usual form of the species. Var. PANICULATUS Engelm. l.c. type loc. Napa Valley, *Bigelow*.

2. **LUZULA** DC. WOODRUSH

Plants of dry or high ground in open or shady or sometimes moist places. Stems hollow, leafy, simple, slender. Leaves softer and flatter than in Juncus,

grass-like and often hairy or villous. Flowers in umbels or panicles or crowded in dense clusters or spikes. Capsule 1-celled; seeds 1 to 3.—Species 61, temperate and cold regions of all continents, but most abundant in the northern hemisphere. (Latin lucus, wood or grove, the habitat of certain species.)

Flowers solitary at the ends of the branches of the inflorescence.
- Pedicels divaricate....1. *L. divaricata.*
- Pedicels erect....2. *L. parviflora.*

Flowers crowded in spikes or dense clusters.
- Leaves flat.
  - Bracts and bractlets conspicuously fimbriate or ciliate....3. *L. subcongesta.*
  - Bracts and bractlets not fimbriate.
    - Flowers in mostly rayed clusters....4. *L. campestris.*
    - Flowers in mostly solitary sessile spikes....5. *L. subsessilis.*
- Leaves channeled; flowers in a dense nodding spike-like panicle....6. *L. spicata.*

1. **L. divaricata** Wats. (Fig. 45a, b.) Stems 6 to 12 inches high, nearly naked, the leaves in a mostly basal tuft; herbage quite glabrous; inflorescence a diffuse cyme with divaricate branches and pedicels.

Sierra Nevada, 7,000 to 11,000 feet. Nevada.

Locs.—Donner Pass, *Heller* 7138; Placer Co., *Carpenter*; Yosemite Park, *H. M. Evans*; Sawtooth Peak, *Hall & Babcock* 5690. Mt. Rose, Nev., *Kennedy.*

Ref.—LUZULA DIVARICATA Wats. Proc. Am. Acad. 14:302 (1879), type loc. northern Sierra Nevada (above Mono Lake, *Brewer* 1794, 2069, 2334; Sierra Co., *Greene, Lemmon*).

2. **L. parviflora** Desv. Stems 1 to 2⅓ feet high, usually rather leafy, densely leafy at base; leaves hairy at the sheaths; inflorescence lax, the branches of the cyme somewhat slender or racemose, distinctly though not strongly drooping; perianth-segments greenish, acute, cuspidate, shorter than the acute shortly-beaked reddish capsule.

Coniferous woods, Sierra Nevada, far North Coast Ranges. North to Alaska, thence east to Labrador. Europe.

Locs.—Coast Ranges: between Requa and Crescent City, *Davy;* Dinsmore Ranch, Van Duzen River Valley, *Tracy* 2877; Eureka, *Tracy* 810; North Fork Coffee Creek, *Goldsmith* 19; Shackelford Creek, w. Siskiyou Co., *Butler* 1673; Widow Creek, Mt. Shasta, *Goldsmith.* Sierra Nevada: McCloud, *Goldsmith* 9; Whitney Mdws. (acc. Coville).

Var. **fastigiata** Buch. Inflorescence more or less corymbose; branches slender, only slightly or scarcely at all drooping.—Sierra Nevada: Yosemite Creek, *Hall & Babcock* 3458; Dinkey Big Trees, *Hall & Chandler* 371.

Refs.—LUZULA PARVIFLORA Desv. Jour. Bot. 1:144 (1808). *Juncus parviflorus* Ehrh. Beitr. 6:139 (1791), type European. *Juncoides parviflorum* Cov. Contr. U. S. Nat. Herb. 4:209 (1893). Var. FASTIGIATA Buch. Krit. Verz. Juncaceen 83 (1880). *L. melanocarpa* Desv. var. *fastigiata* E. Mey. Linnaea 3:374 (1828), type loc. Unalaska.

3. **L. subcongesta** Jepson n. comb. (Fig. 45e-e.) Similar in habit to L. parviflora; pedicels very much shortened and the flowers in capitate clusters at the ends of the branches of the cyme; bracts and bractlets fimbriate; perianth dark reddish-brown, merely acute or membranously pointed; capsule dark or black.

Grassy spots amongst granite rocks, northern Sierra Nevada, 7,000 to 8,000 feet.

Locs.—Sonora Peak, *A. L. Grant* 415; Donner Pass, *Heller* 7135.

Refs.—LUZULA SUBCONGESTA Jepson. *L. spadicea* var. *subcongesta* Wats. Bot. Cal. 2:202 (1880), type loc. Donner Lake, *Torrey, Greene. Juncoides subcongestum* Cov. Muhl. 1:105 (1904). *J. subcapitatum* Heller, Bull. Torr. Club 31:401 (1904).

4. **L. campestris** DC. COMMON WOOD-RUSH. (Fig. 46a-e.) Stems erect, leafy, 8 to 15 inches high; herbage sparsely villous; leaf-blades 3 to 6 inches long, 2 to 3 lines wide, flat, villous at the throat and sparsely so on the margins; bract foliaceous, shorter than or usually much exceeding the inflorescence; flowers

Fig. 45. *a*, LUZULA DIVARICATA Wats., habit, × ½; *b*, perianth and capsule, × 8. *c*, L. SUBCONGESTA Jepson, lower portion of plant, × 1; *d*, inflorescence, × 1; *e*, perianth and capsule, × 10.

Fig. 46. *a*, LUZULA CAMPESTRIS DC., habit, × ½; *b*, inflorescence, × ½; *c*, perianth and capsule, × 8. *d*, var. CONGESTA Mey., inflorescence, × ½. *e*, L. SUBSESSILIS Buch., inflorescence, × 1. *f*, L. SPICATA, DC., habit, × 1; *g*, perianth and capsule, × 10.

spicate; spikes 3 to 4 lines long, erect, cymosely disposed, some on rays ¼ to 1 (or 2) inches long, some subsessile; bractlets scarious, hyaline and ciliate above; perianth segments lanceolate, acuminate, 1½ lines long, tinged with dark brown; seed dark, with a whitish conical appendage at one end ¼ to ½ as long.

Partially shaded spots, mountain and coast regions of California, 100 to 6000 feet. North America, Europe, Asia.

Locs.—Mt. San Jacinto, *Hall* 2460; Kaweah River Valley, acc. Coville (Contrib. U. S. Nat. Herb. 4:208); Italian Bar, Tuolumne Co., *A. L. Grant* 24; Calaveras Co., *Blasdale;* Eight Mile, Wawona road, *Jepson* 4292; Little Yosemite, *Jepson* 4405; Lake Merced, Yosemite Park, *Jepson* 4425; Big Creek, Big Oak Flat road, *Jepson* 8347; Cascade Creek, Tuolumne Co., *Jepson* 6531; Lassen Co., *Baker & Nutting;* Pine Creek, Big Valley Mountains, *Baker & Nutting;* Medicine Lake, *Goldsmith;* Shackelford Creek, w. Siskiyou Co., *Butler* 1701; Eureka, *Tracy* 1087; Conn Valley, *Jepson;* Martinez, *Chandler* 851; Berkeley, *Davy;* Alameda, *Bioletti;* Angel Isl., *Davy* 6912; Pacific Grove, *Davy* 7493. Unalaska, *Jepson* 55.

Var. **congesta** Buch. (Fig. 46d.) Spikes several, congested into a pyramidal or conical head; perianth often dark-brown.—California coast: Pacific Grove, *Heller* 6467; Lake Merced, San Francisco, *Davy;* Inverness, *Jepson* 8304; Eureka, *Tracy* 3642.

Var. **sudetica** Celak. Inflorescence congested; perianth almost black.—Mineral King acc. Coville. Europe.

Refs.—LUZULA CAMPESTRIS DC. Fl. Fr. 3:161 (1805). *Juncus campestris* L. Sp. Pl. 1:329 (1753), type European. *Luzula comosa* Mey. Syn. Luz. 21 (1823); Jepson, Fl. W. Mid. Cal. 95 (1901); var. *macrantha* Wats. Bot. Cal. 2:203 (1880), no station given; perianth 2½ lines long.—San Bernardino Mts. acc. Parish, Pl. World 20:178. *Juncoides campestre* Ktze. Rev. Gen. Pl. 722 (1891). Var. CONGESTA Buch. Monog. Juncac. 162 (1890). *L. comosa* var. *congesta* Wats. Bot. Cal. 2:203 (1880). Var. SUDETICA Celak. Prodr. Fl. Böhm. 749 (1881). *Juncoides campestre* var. *sudeticum* Cov. Contrib. U. S. Nat. Herb. 4:208 (1893). *Juncus sudeticus* Willd. Sp. Pl. 2:221 (1799), type loc. Silesia.

5. **L. subsessilis** Buch. (Fig. 46e.) Erect or ascending, 5 to 12 inches high; spikes solitary or rarely 2 in a place, sessile or nearly so, 2½ to 4 lines long.

Central California coast. North to British Columbia.

Loc.—Olema, *Davy* 4320.

Refs.—LUZULA SUBSESSILIS Buch. Osterr. Bot. Zeitschr. 290 (1898). *L. comosa* var. *subsessilis* Wats. Bot. Cal. 2:203 (1880), type loc. not given.

6. **L. spicata** DC. (Fig. 46f, g.) Densely tufted, 4 to 12 inches high, without rootstocks; leaves narrowly linear, channeled; flowers in sessile clusters, forming a spike-like panicle; panicle nodding, sometimes interrupted, ½ to ¾ inch long; perianth segments bristle-pointed, equaling or exceeding the bluntly acute capsule.

High mountains, Sierra Nevada, 9,000 to 12,500 feet. North to Alaska, east to New England. Europe, Asia.

Locs.—Mt. Whitney, *Jepson* 1090; Mineral King (acc. Coville, Contrib. U. S. Nat. Herb. 4:209); Lake of Lone Indian, Fresno Co., *A. L. Grant* 1547; Soda Springs Cañon, Kennedy Lake, *A. L. Grant* 541.

Refs.—LUZULA SPICATA DC. Fl. Fr. 3:161 (1835). *Juncus spicatus* L. Sp. Pl. 330 (1753). *Juncoides spicatum* Ktze. Rev. Gen. Pl. 725 (1891).

LILIACEAE. LILY FAMILY

Perennial herbs, the stems from bulbs or rootstocks, or rarely shrubs or trees. Leaves all basal and the stem a scape, or the stem more or less leafy and frequently branching. Flowers regular and perfect; perianth with 6 segments or lobes, the 3 outer and 3 inner petaloid and alike (or nearly) in shape and color, or sometimes strongly differentiated; when strongly differentiated by shape or color the outer 3 are called sepals and the inner 3 petals. Stamens 6, sometimes 3 or 4. Ovary superior, 3-celled; styles 3, or 1 and entire or 3-cleft; stigmas 3, rarely 1. Fruit a capsule or berry.—Maianthemum has a 2-merous flower, Scoliopus a 1-celled ovary, Veratrum polygamous flowers, and Smilax dioecious flowers. Cauline leaves alternate, or sometimes whorled in Fritillaria and Lilium, netted-veined and whorled in Trillium.—About 200 genera and 2500 species; all continents. The genus Odontostomum is peculiar to California, while Chlorogalum,

Bloomeria and Scoliopus are almost restricted to its limits. There are about 88 species and 23 varieties peculiar to California, chiefly in Allium, Brodiaea and Calochortus.

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A. Fruit a capsule.

1. Perennial herbs.

Styles 3 and distinct (except no. 1); plants with rootstocks (except nos. 4 and 5); perianth-segments distinct.
- Leaves equitant.
  - Stamens with densely woolly filaments; flowers in a loose raceme.....1. Narthecium.
  - Stamens not woolly; flowers in a head or capitate raceme.....2. Tofieldia.
- Leaves not equitant.
  - Stem glabrous, the leaves mostly basal.
    - Perianth-segments not glandular.
      - Leaves very dry and sedge-like, rough-edged; flowers not nodding.....3. Xerophyllum.
      - Leaves not sedge-like; flowers nodding.....4. Stenanthium.
    - Perianth-segments glandular near the base.....5. Zygadenus.
  - Stem pubescent (at least above), very leafy.....6. Veratrum.

Style 1, entire, or 3-lobed or 3-parted, or none; plants with bulbs (except no. 7).
- Stems from a tunicated bulb or corm.
  - Flowers with bracts.
    - Flowers in racemes or panicles.
      - Perianth-segments united below into a tube.
        - Flowers in a cluster on the ground; anthers basifixed.....7. Leucocrinum.
        - Flowers borne on a more or less leafy stem.
          - Perianth-segments ascending; anthers versatile.....8. Hesperocallis.
          - Perianth-segments reflexed; anthers basifixed.....9. Odontostomum.
      - Perianth-segments distinct, withering-persistent; leaves basal; anthers versatile.
        - Flowers in a raceme.
          - Raceme dense; perianth 2½ to 5 lines long.....10. Schoenolirion.
          - Raceme loose; perianth about 1 inch long.....11. Camassia.
        - Flowers in a panicle.....12. Chlorogalum.
    - Flowers in umbels or heads.
      - Perianth-segments distinct or nearly so; anthers versatile.
        - Filaments not appendaged, often dilated at base.
          - Umbel in the bud sheathed by a continuous spathe splitting into 2 or 3 bracts; bractlets none.....13. Allium.
          - Umbel in the bud covered by 3 distinct bracts; pedicels with minute bractlets.....14. Muilla.
        - Filaments arising from a cup-like or winged appendage.....15. Bloomeria.
      - Perianth-segments united below into a tube; stamens with anthers 6 or 3; anthers basifixed or versatile.....16. Brodiaea.

Flowers without bracts; leaves 1 or few, basal or mostly so; anthers basifixed.
Perianth-segments unlike, the inner very showy, usually with a glandular pit at base; leaves narrow ..... 17. CALOCHORTUS.
Perianth-segments alike or nearly so, colored alike, without glandular pits; leaves broad ..... 18. ERYTHRONIUM.
Stems from a scaly bulb.
Perianth campanulate; anthers attached at base or below the middle; style 3-cleft or rarely entire ..... 19. FRITILLARIA.
Perianth funnelform; anthers versatile; style entire ..... 20. LILIUM.

2. SHRUBS OR TREES.

Flowers rather large; fruit not winged ..... 21. YUCCA.
Flowers minute; fruit 3-winged ..... 22. NOLINA.

B. Fruit a berry (except nos. 29 and 30); plants with rootstocks.

Flowers perfect; stems not prickly.
Leaves reduced to scales; branchlets filiform ..... 23. ASPARAGUS.
Leaves foliaceous.
Plants with leafy stems; stamens 6.
Stem branching; flowers few, drooping.
Flowers axillary; filaments short, flattened ..... 24. STREPTOPUS.
Flowers terminal; filaments thread-like ..... 25. DISPORUM.
Stem simple; flowers many or numerous in a terminal raceme or panicle ..... 26. SMILACINA.
Plants with only 2 or 3, or at most few leaves.
Leaves, or at least one of them, basal, parallel-veined.
Perianth-segments and stamens 4; leaves 2 or 3 ..... 27. MAIANTHEMUM.
Perianth-segments 6.
Stamens 6; leaves about 5 ..... 28. CLINTONIA.
Stamens 3; leaves 2 ..... 29. SCOLIOPUS.
Leaves 3 in a single whorl at summit of stem, netted-veined; flower 1; stamens 6. 30. TRILLIUM.
Flowers dioecious; stems prickly; leaves with climbing tendrils ..... 31. SMILAX.

1. **NARTHECIUM** Moeh. BOG ASPHODEL

Stems scape-like, with a dense tuft of basal leaves borne on a creeping rootstock. Leaves narrowly linear and equitant, the cauline few and small. Flowers yellowish-green, in a terminal raceme. Pedicels with a bractlet at the middle. Perianth with 6 distinct segments. Stamens 6, the filaments densely woolly, except at the very base. Ovary attenuate upward to the scarcely lobed stigma. Capsule loculicidal, with thin-chartaceous walls. Seeds numerous with a long bristle-like point at each end.—Species 4, northern hemisphere. (Narthex, Greek name of Ferula, the stems of which were used as rods; applied here on account of the scapose stems.)

1. **N. californicum** Baker. Stems 18 to 22 inches high; basal leaves iris-like, 4 to 10 inches long, 1½ to 2 lines wide, the cauline 2 or 3, 1 to 4 inches long; raceme loose, 3½ to 7 inches long; perianth-segments oblong-linear, narrowed upward or acute, 3 to 4 lines long; anthers brick-red; ripe capsules salmon-color; seeds, including the points or tails, 5 lines long.

Marshy ground: North Coast Ranges from Mendocino Co. to Del Norte and Trinity cos.; Sierra Nevada from Plumas Co. to Fresno Co. Southwestern Oregon.

Locs.—Swift Creek, Salmon Mts., *Hall* 8681; Butterfly Valley, Plumas Co., *R. M. Austin;* Nevada Co., *Carpenter*; Heather Lake, El Dorado Co., *Laura Dodge*; Le Conte Falls, Tuolumne Cañon, *F. M. Reed*; Grouse Creek, LeConte Cañon, Middle Fork Kings River, acc. *Peirson*. East Fork Illinois River, Josephine Co., Ore., *Jepson*.

Ref.—NARTHECIUM CALIFORNICUM Baker, Jour. Linn. Soc. 15:351 (1877), type loc. Red Mt., nw. Mendocino Co., *Bolander* 6548.

2. **TOFIELDIA** Huds.

Stems simple, naked above, arising from a slender rootstock. Leaves linear, sedge-like, equitant, mostly in a basal tuft. Flowers small, greenish white, ours

borne by 3s in a head or dense capitate raceme. Pedicels (in ours) with a membranous 3-lobed involucre above the middle or at the summit. Perianth-segments 6, distinct, spreading, persistent. Stamens 6. Ovary 3-lobed; styles 3, short, distinct. Capsule obovate, acute, beaked by the spreading persistent styles, septicidal. Seeds with a membranous coat, in ours tailed at one end.—Species about 15, mostly North Temperate Zone, a few in the Andes. (Tofield, English botanist, of Doncaster, a correspondent of Hudson.)

1. **T. occidentalis** Wats. Stems ½ to 2 feet high, glandular; leaves 2 to 12 inches long, 1 to 3 lines wide; racemes ½ to 1 inch long; perianth-segments oblong, 1½ to 3 lines long; filaments lanceolate; capsule 3 to 4 lines long; seeds with a loose cellular coat, appendaged at the free end with a tail as long or somewhat longer than the body.

Mountain bogs, 3500 to 7500 feet: North Coast Ranges from Mendocino Co. north to Siskiyou Co., thence southerly in the Sierra Nevada. North to British Columbia.

Locs.—North Coast Ranges: Mendocino Co.; Trinity Summit, *Manning;* Dorleska, Salmon Mts., *Hall* 8658; Onion Patch, w. Siskiyou Co., *Jepson* 2879; Shackelford Creek, w. Siskiyou Co., *Butler* 1702; Sisson, *Jepson*. Sierra Nevada: Lassen Peak, *Chesnut & Drew*; Colby, Butte Co., *R. M. Austin*; Heather Lake, El Dorado Co., *Laura Dodge*; Nellie Lake, Fresno Co., *A. L. Grant* 1085; Lake Independence, *Jepson* 8060; Alta Mdws., Sequoia Park, *Hopping* 194; Little Kern River, *Purpus* 5232.

Refs.—Tofieldia occidentalis Wats. Proc. Am. Acad. 14:283 (1879), type loc. Mendocino Co., *Kellogg & Harford* 1002; MacBride, Contrib. Gray Herb. 49:48 (1917). The involucre varies with age and otherwise from deeply to shallowly lobed in such a way as to give no character for segregation of a series of specimens; in a similar manner the capsular beaks may be either erect or spreading. Therefore, neither *T. glutinosa* Wats. Bot. Cal. 2:184 (1880) nor *T. intermedia* Rydb. Bull. Torr. Club, 27:528 (1900) indicate specific entities in California. All California specimens examined show but a single tail to the seed.

3. **XEROPHYLLUM** Michx.

Stem simple, stout and leafy, ending above in a many-flowered raceme, and arising from a tuber-like woody rootstock bearing cord-like roots, the basal leaves in a dense tuft, numerous, narrowly linear and elongated, dry, rough-edged. Flowers white or cream-color, on slender white pedicels. Perianth-segments 6, distinct, several-nerved, persistent. Stamens 6. Ovary 3-lobed; styles 3, distinct. Capsule chartaceous, loculicidal, or occasionally also septicidal. Seeds 2 to 4 in each cell.—Species 3, North America. (Greek xeros, dry, and phullon, leaf, the foliage very hard and dry.)

1. **X. tenax** Nutt. Elk Grass. Fire-Lily. Stem 2 to 6 feet high; basal leaves 1¼ to 3 feet long, 1 to 3 lines wide; raceme dense, ½ to 1½ feet long; pedicels 1 to 2 inches long, each with a scarious bract at base, spreading in flower, past anthesis strictly erect, spreading again in fruit; perianth-segments linear-oblong, 4 lines long, the stamens a little longer.

Dry ridges: Monterey and northward in the Coast Ranges to Del Norte Co., where it is very common; Sierra Nevada from Placer Co. north to Siskiyou Co. North to British Columbia and Montana.

The plants commonly bloom only after 5 to 7 years of preparation. May-July. The fibres of the leaves were employed by the Hupas and other native tribes for making garments and for decorative work in baskets, while the bulbous rootstocks furnished a nourishing food after being roasted in a pit for two days. Also called Squaw-grass, Bear-grass, Turkey-beard, Bear-Lily, and Pine-Lily.

Locs.—Mt. Tamalpais (a heavy flowering in May, 1915); Sonoma, *Bioletti*; Ft. Bragg, *W. C. Mathews*; South Fork Mt., Humboldt Co., *Chesnut & Drew*; Preston Peak, *Jepson* 2873; Shelley Creek, Del Norte Co., *Jepson*; Mt. Eddy, *Copeland* 3872; Placer Co., *M. M. Hardy*.

Refs.—Xerophyllum tenax Nutt. Gen. 1:235 (1818); Jepson, Erythea, 6:75 (1898), Fl. W. Mid. Cal. 123 (1901). *Helonias tenax* Pursh, Fl. 1:243 (1814), type loc. Collins Creek, Ida., *Lewis*. *Xerophyllum setifolium* Lindl. Bot. Reg. t. 1613 (1833), not Michx.

4. **STENANTHIUM** Kunth.

Stem from a tunicated bulb, the narrow leaves mostly basal. Flowers (in ours) in a simple raceme, nodding. Perianth purplish green, its segments narrow, acuminate. Stamens 6, much shorter than and inserted on the base of the perianth-segments; anthers reniform, 1-celled. Ovary ovoid; styles 3. Capsule septicidal, 3-beaked. Seeds winged.—Species 5. North America and Asia. (Greek steno, narrow, and anthos, flower.)

1. **S. occidentale** Gray. Stem 6 to 11 inches high; leaves linear, tapering to base and apex, 4 to 7 inches long, 2 to 7 lines wide; perianth narrow-campanulate, 5 lines long, its tips reeurved.

High-montane in Trinity Co. North to Alberta.

Loc.—Union Creek, Salmon Mts., *Hall* 8626; only record for California.

Refs.—STENANTHIUM OCCIDENTALE Gray, Proc. Am. Acad. 8:405 (1873), type loc. n. Rocky Mts., *Bourgeau*. *Stenanthella occidentalis* Rydb. Bull. Torr. Club, 27:531 (1900).

5. **ZYGADENUS** Michx. ZYGADENE

Stem simple, scape-like, in ours from a tunicated bulb. Outer coats of the bulb mostly dark or black. Herbage glabrous and somewhat glaucous. Leaves linear, mostly basal. Flowers erect, greenish-white, in a raceme or paniele. Perianth nearly rotate, withering-persistent; segments ovate to oblong-lanceolate, with a green glandular spot at the narrow or shortly clawed base. Stamens 6, free from the segments and about equaling them. Styles 3, distinct, persistent. Capsule deeply 3-lobed.—Species 11, North America and Asia. (Greek zugon, a yoke, and aden, a gland.)

Raceme narrow, simple; inner segments spathe-like, the margins abruptly infolded just above the claw.....1. *Z. venenosus.*

Raceme broader, more or less compound.

Perianth-segments with central area slightly depressed, the border more or less undulate; lower flowers often staminate; bracts membranous.

Leaves narrow (3 to 5 lines wide); stamens longer than or equaling the perianth; anthers yellow.....2. *Z. paniculatus.*

Leaves ¾ to 1 inch wide; stamens shorter than the perianth; anthers white.....3. *Z. exaltatus.*

Perianth-segments plane; flowers generally all perfect.

Segments ovate-lanceolate, the outer not clawed; bracts more or less green, conspicuous.....4. *Z. fremontii.*

Segments broadly elliptic, all short-clawed; bracts membranous, very small.....5. *Z. brevibracteatus.*

1. **Z. venenosus** Wats. DEATH CAMAS. Plants ⅔ to 2 feet high; bulb oblong-ovate, ⅓ to ½ (or ¾) inch broad; leaves narrowly linear, 1 to 3 lines broad, carinate and usually folded, more or less seabrous; raceme commonly simple and narrow, 3 to 5 or 10 inches long, the bracts lanceolate, long-attenuate or even flagellate, much exceeding the buds and about as long as the pedicels; perianth segments deltoid-ovate to oblong, 1½ to 2 lines long, the outer broader and with a shorter claw or sessile; gland seated above the claw furnished with a more or less evident circular ridge or thin crest, the crest on the lower side continuous with the spathe-like infolding of the basal margins of the blade; stamens about equaling the segments, somewhat adnate below; anthers white; capsule 4 to 5 (or 7) lines long.

Wet meadows: Coast Ranges, mostly near the coast; Sierra Nevada, both east and west slopes; Southern California. North to British Columbia.

Econ. Note.—This species (called "Lobelia" by the cattlemen of Modoc Co.) and Z. paniculatus are both poisonous to cattle, while the former is especially poisonous to sheep, which mistake the young leaves for grass. Probably all the species of the genus are more or less noxious. Hogs seem to be immune, whence the folk name "Hog's Potato" for Z. venenosus.

Locs.—Sonoma Co. (acc. Bot. Cal. 2:183); Jolon, Monterey Co., *Brewer* 573; Palomar, *Jepson* 1543; Tehachapi, *Heller* 7823; Lloyd Mdws., Kern River, *Jepson* 4900; Pine Ridge, Fresno Co., *Hall & Chandler* 243; Bishop, *Hall & Chandler* 7281; Yosemite Park, *Jepson*

3187 (Lake Merced), 4509 (Benson Lake), 3449 (Hetch Hetchy); Lake Eleanor, *A. L. Grant* 1254; Avery, Calaveras Co., *A. L. Grant*; Rubicon Park, Lake Tahoe, *Setchell & Dobie*; Bear Valley, Nevada Co., *Jepson*; Lake Independence, *Jepson* 8065; Willow Ranch, Warner Mts., *L. S. Smith* 940; Shasta Valley, *Butler* 1414; Indian Valley, ne. Lake Co., *Jepson* 8982; Knoxville ridge, ne. Napa Co., *Jepson* 9040.

Var. **micranthus** Jepson n. comb. Raceme more open and broader (pedicels ¾ to 1 inch long), the bracts relatively shorter; flowers usually larger, less delicate, ridge about the gland thickened, outer segments often not clawed.—North Coast Ranges and south to Contra Costa Co. This sometimes approaches Z. fremontii in habit, but the gland is more sharply defined than in that species.

Locs.—Mt. Diablo, *Chandler* 978; Tiburon, *Jepson*; Red Mt., se. Mendocino Co., *Jepson* 3030; Round Valley, *Westerman;* Sherwood Valley, *Davy* 5187; Ft. Bragg, *W. C. Mathews;* Buck Mt., *Tracy* 2779; Hubbards Sta., Humboldt Co., *Jepson* 1907.

Refs.—ZYGADENUS VENENOSUS Wats. Proc. Am. Acad. 14:279 (1879), type loc. Monterey Co.; Jepson, Fl. W. Mid. Cal. 122 (1901). Var. *ambiguus* Jones, Contrib. 12:77 (1908). *Toxicoscordion venenosum* Rybd. Bull. Torr. Club 30:272 (1903). *T. arenicola* Heller, Muhl. 2:182 (1906), type loc. foothills west of Bishop, *Heller* 8321. Var. MICRANTHUS Jepson. *Zygadenus micranthus* Eastw. Bull. Torr. Club 30:483 (1903), type loc. Cahto, Mendocino Co., *Eastwood. Toxicoscordion micranthum* Heller, Muhl. 6:83 (1910).

2. **Z. paniculatus** Wats. SAND-CORN. Plants 8 to 16 inches high; leaves all sheathing; main raceme with short dense supplementary racemes below; bracts ovate-lanceolate; perianth-segments deltoid-ovate, acute or acuminate, greenish thickened on the back at base, the claws very short or sometimes nearly none; gland seated above the claw, indefinitely margined, sometimes spreading nearly to the middle of the segment; stamens much exserted or at least equaling the segments; anthers yellow; capsule ½ to 1 inch long.

Sage-brush hills east of the Sierra Nevada crest from Nevada Co. to Siskiyou Co. Nevada to Washington and Montana.

Biol. Note.—The scales of the hypogaeous winter bud are very large (¾ inch broad) and conspicuous. The bulb is seated 6 to 8 inches deep and often gives rise to 2 or 3 shoots.

Locs.—Truckee, *Sonne;* Mt. Lassen, *Jepson* 4088; Little Shasta, *F. W. Hooper*; Buck Creek, Warner Mts., *L. S. Smith* 928; Fort Bidwell, *Manning.*

Refs.—ZYGADENUS PANICULATUS Wats. Bot. King 343 (1871), based on Oregon, Washington and Nevada plants; Piper, Fl. N.W. Coast 99 (1915). *Helonias paniculata* Nutt. Jour. Acad. Phila. 7:57 (1834), type loc. Flat-Head River, Mont., *Wyeth. Toxicoscordion paniculatum* Rydb. Bull. Torr. Bot. Club 30:272 (1903).

3. **Z. exaltatus** Eastw. Plants 2⅔ to 3½ feet high; bulb oblong-ovoid, 2 to 3 inches long; basal leaves large (¾ to 1¼ inches wide), in a conspicuous sheathing tuft; main raceme 8 to 12 inches long, with 3 to 5 supplementary racemes below, the lower bearing only staminate flowers; bracts ovate-lanceolate; perianth-segments oblong-elliptic, with claws; gland extending the length of the claw, bordered on each side by a narrow non-glandular area and terminating upon the base of the blade in a somewhat darker rounded area toothed above; stamens shorter than the perianth; anthers dull white; capsule ¾ inch long.

Sierra Nevada, from Calaveras Co. to Tulare Co., about 2000 to 4000 feet.

Locs.—Avery Sta., Calaveras Co., *A. L. Grant*; Bonita Mdw., Tulare Co., *Hall & Babcock* 5177.

Refs.—ZYGADENUS EXALTATUS Eastw. Bot. Gaz. 41:283 (1906), type loc. Mokelumne Hill, *F. E. Blaisdell. Toxicoscordion exaltatum* Heller, Muhl. 6:83 (1910).

4. **Z. fremontii** Wats. STAR ZYGADENE. Plants 1¼ to 2¼ feet high; bulb globose or broadly oblong, ½ to 1¼ inches broad; basal leaves 8 to 16 (or 20) inches long, 5 to 9 (or 13) lines broad, usually somewhat falcate-curving, the cauline few and shorter; main raceme with supplementary racemes below; perianth-segments ovate-lanceolate, 3 to 7 lines long, the outer broader, not clawed or shortly so, the inner contracted to a broad claw; gland greenish yellow, toothed above; stamens about half as long as the segments; capsule oblong, 6 to 10 lines long.

Deep soil on bushy hillsides: Coast Ranges, south to Southern California. Common and variable. Apr.-June.

Locs.—Rosewood, Tehama Co., *Jepson*; Round Valley, Mendocino Co., *Westerman*; Kelseyville, *H. Irwin* 30; Howell Mt., *Jepson* 546; Hood's Peak Range, *Jepson;* Kenwood, Sonoma Co., *F. T. Bioletti*; Vaca Mts., *Jepson* 2182; San Pablo Creek, *Jepson* 3004 (gland darker above the claw and bordered as in Z. venenosus); Berkeley Hills, *Tracy* 1790; Palo Alto, *C. F. Baker*; Los Gatos, *Heller* 7287; Loma Prieta, *Davy* 659; Winchester, Riverside Co., *Hall* 383.

Var. **minor** Jepson. Plants 4 to 8 inches high; raceme simple, short, broad, with few flowers.—An early form near the coast. Mar.

Locs.—Taylor Mt., Sonoma Co., *M. S. Baker* 719; San Francisco, *Jepson*; Burlingame, *Inez Smith*; Monterey, *Jepson* 2987; San Luis Obispo, *Summers.*

Var. **salsus** Jepson n. var. Very stout, ¾ to 1 foot high; basal leaves in a conspicuous sheathing tuft; glands lighter in color.—(Robustior, unc. 9–12 altа; folia basalia caespitosa vaginalia manifesta; glandulae pallidae.)—Alkaline flats, Vacaville, *Jepson* (type).

Refs.—ZYGADENUS FREMONTII Wats. Bot. King 343 (1871); Jepson, Fl. W. Mid. Cal. 122 (1901). *Anticlea fremontii* Torr. Pac. R. Rep. 4:144 (1856), type loc. Oakland Hills, *Bigelow. Toxicoscordion fremontii* Rydb. Bull. Torr. Club, 30:273 (1903). (*Z. speciosus* Dougl.; Hook. Fl. Bor. Am. 2:177,—1839, type from Cal., *Douglas*, is an earlier name than Anticlea fremontii but its application is uncertain.) Var. MINOR Jepson, l.c. *Z. chloranthus* var. *minor* H. & A. Bot. Beech. 402 (1841), type from Cal., *Douglas. Toxicoscordion fremontii* var. *minor* Gates, Jour. Linn. Soc. Bot. 44:157 (1918). Var. SALSUS Jepson.

5. **Z. brevibracteatus** Hall. Plants 15 to 22 inches high; bulb round-ovoid, 1 to 1¼ inches broad; basal leaves 6 to 8 inches long, ¼ inch broad, linear, somewhat revolute and falcate-curving; raceme loose, its pedicels ½ to 1¼ inches long, widely or horizontally divaricate; supplementary basal racemes 1 or 2, rigid, widely spreading; perianth-segments 2 to 3 lines long, distinctly short-clawed, the outer rhomboidal-ovate, the inner a little narrower; gland green, extending just above the claw, its lower margin bounded by a sharp low ridge; stamens ⅔ the length of segments; capsule 7 to 8 lines long.

Sandy mesas, western and southern borders of the Mohave Desert.

Locs.—Mt. Pinos, *Hall* 6533; Cajon Pass, *Hall* 6219; Hesperia, *Jepson* 6140; Barstow, *Jepson* 5813; Shay's Well (nw. of Warren's Well), *Jepson* 5956.

Refs.—ZYGADENUS BREVIBRACTEATUS Hall, Univ. Cal. Pub. Bot. 6:165 (1915), type loc. Cottonwood Sprs., Cottonwood Mts., *Hall* 6020. *Z. fremontii* var. *brevibracteatus* Jones, Contrib. W. Bot. 12:78 (1908), type loc. Victorville. *Toxicoscordion brevibracteatus* Gates, Jour. Linn. Soc. Bot. 44:158 (1918).

6. **VERATRUM** L. False Hellebore

Stem tall and leafy from a short thick rootstock, bearing coarse fibrous roots. Leaves broad, plaited, coarsely nerved. Stem and inflorescence pubescent. Flowers polygamous, greenish or cream-color, in a terminal panicle. Perianth of 6 distinct obovate-oblong segments, somewhat contracted at the base, adnate to the base of the ovary. Stamens 6, opposite the perianth-segments and free from them, shorter by half and recurving; filaments subulate; anthers with confluent cells, cordate. Styles 3, persistent, mostly curved. Capsule 3-celled, 3-lobed.—About 10 species, northern hemisphere. (Latin vere, truly, and ater, black, in reference to the color of the roots.)

Ovary glabrous.

Perianth segments not fringed; capsule oblong-ovoid, ⅞ to 1¼ inches long.

Flowers dull white; common.....1. *V. californicum.*

Flowers green; rare.....2. *V. viride.*

Perianth segments deeply fringed; capsule depressed-globose with notched apex, much-lobed laterally, 4 lines long.....3. *V. fimbriatum.*

Ovary densely woolly; perianth segments erose or lightly fringed.....4. *V. insolitum.*

1. **V. californicum** Durand. Corn Lily. Stem very stout and leafy, suggesting a cornstalk, 3 to 5 or 6 feet high; leaves ovate or elliptic-oblong, sheathing at base, 6 to 12 inches long or the uppermost lanceolate and shorter; panicle 1 to 1½ feet long, the lower portion often sterile; bracts mostly membranous; pedicels 1 to 4 lines long; flowers dull white, perianth-segments obovate, mostly

obtuse, 5 to 9 lines long, greenish margined at base, greenish glands at base of segments 2, or one and Y-shaped, often denticulate or erose at apex; capsule walls firm-chartaceous; seeds broadly wing-margined.

Wet flats and about springs, a characteristic plant of meadows in the Sierra Nevada at 4500 to 8500 feet; also in the North Coast Ranges and high mountains of Southern California. North to Washington, east to Colorado and south into Mexico. Often reported as poisonous to stock and sometimes called False Hellebore. July-Aug.

Locs.—North Coast Ranges: Sisson, *Jepson* 5796; Log Lake, Shackelford Creek, *Butler* 534; Trinity Summit, *Manning;* Dinsmore Ranch, Van Duzen River, *Tracy* 4280; South Yollo Bolly, *Jepson* (perianth segments oblong-lanceolate); Sherwood, *Davy.* Sierra Nevada: Mt. Bidwell, *Manning;* Bear Valley, Nevada Co., *Jepson;* Silver Lake, Amador Co., *E. Mulliken* 134; Rancheria Mt., *Jepson* 4603; Lake Merced, *Jepson* 3195; Little Kern River, *Culbertson* 4322; Hassock Mdw., Tule River, acc. *Hopping.* Southern California: Bluff Lake, San Bernardino Mts., *Pcttibone*; Mt. San Jacinto, *Jepson* 2324; Palomar, *McClatchie.*

Refs.—VERATRUM CALIFORNICUM Dur. Jour. Acad. Phila. ser. 2, 3:103 (1855), type loc. near Nevada City, *Pratten*; Jepson, Fl. W. Mid. Cal. 123 (1901).

2. **V. viride** Ait. Similar to V. californicum in habit; branches of the panicle more or less drooping; principal bracts foliaceous; perianth green, about 4 lines long.

Subalpine meadows, Siskiyou Co. North to Alaska, east to New Brunswick, thence south to Georgia.

Loc.—Salmon Mts., *Butler* 536. Our only known locality in Cal.

Ref.—VERATRUM VIRIDE Ait. Hort. Kew 3:422 (1789), type from North America.

3. **V. fimbriatum** Gray. Similar in habit to the preceding; leaves linear-lanceolate, ½ to 1½ feet long, 1 to 2 or 4 inches wide; panicle ½ to 1¾ feet long, its branches widely spreading; pedicels 4 lines long; perianth-segments rhombic-ovate, 2 to 5 lines long, the margin cleft into filiform segments, except at the broad base which bears two oblong more or less glandular spots reaching to the middle of the segment and separated by a furrow; capsule walls membranous; seeds green, scarcely margined.

Vicinity of the coast, Mendocino "White Plains" or pine barrens. July.

Locs.—Ft. Bragg, *W. C. Mathews*; Albion, *Davy.*

Refs.—VERATRUM FIMBRIATUM Gray, Proc. Am. Acad. 7:391 (1868), type loc. Mendocino coast plain, *Bolander*; Jepson, Fl. W. Mid. Cal. 123 (1901).

4. **V. insolitum** Jepson n. sp. Stems 4 to 5 feet high; leaves elliptic, acute, 7 to 8 inches long, the uppermost lanceolate, 6 to 7 inches long or less; panicle 11 to 20 inches long, composed of elongated lanate-tomentose racemes; perianth-segments white, 3 to 4 lines long, obovate, mostly obtuse, irregularly ciliate or crose, or the inner segments irregularly and very shallowly fimbriate, all with 2 dark glandular spots at base; ovary densely woolly; capsule unknown.—(Folia elliptica acuta unc. 7–8 longa, summa lanceolata; panicula racemis elongatis lanato-tomentosis; segmenta perianthii lin., 3–4 longa, alba obovata impariter erosa, ciliata vel breviter fimbriata, basi maculis duabus atratis glanduliferis; ovarium tomentosissimum.)

Red-clay hills, in chaparral, Del Norte Co. Also west fork Illinois River, southern Oregon.

Locs.—Adams Sta. to Shelley Creek, *Jepson* 2915 (type); Red Hill (South Fork Smith River), *Jepson* 2900.

7. **LEUCOCRINUM** Nutt.

Leaves tufted on a very short rootstock, the roots cordlike. Flowers showy, pure white, fragrant, in a central cluster on the ground, the pedicels arising directly from the rootstock. Perianth persistent, salverform, its tube slender, very much elongated, its segments oblong-lanceolate. Stamens 6, inserted near the summit of the tube. Ovary ovate-oblong, seated below the ground at the

base of the perianth-tube; style 1, persistent, elongated, tubular, the orifice slightly 3-lobed. Capsule triangular-obovate, loculicidal. Seeds angled, black.—Species one, western United States. (Greek leuco, white, and krinon, a lily.)

1. **L. montanum** Nutt. SAND LILY. Leaves linear, many-nerved, 3 to 5 inches long, ½ to 2½ lines broad, the bases surrounded by scarious bracts; pedicels 2 to 6 lines long; perianth-segments oblong, 7 to 9 lines long, the tube 2 to 5 inches long.

Mountain valleys, northern Sierra Nevada, from Sierra Co. to Modoc and Siskiyou cos., 4000 to 5000 feet. Plentiful in its special localities but the localities few. Oregon and Nevada east to Nebraska.

Locs.—Adin, *M. S. Baker*; Ft. Bidwell, *Manning*.

Refs.—LEUCOCRINUM MONTANUM Nutt.; Gray, Ann. Lyc. N. Y. 4:110 (1837), type loc. plains of the upper Platte River, *Nuttall*; Wats. Bot. King 349, pl. 36, figs. 1–3 (1871).

8. HESPEROCALLIS Gray

Stem straight, simple, somewhat leafy, arising from a tunicated bulb. Leaves narrow. Flowers in a raceme, with conspicuous scarious bracts and pedicels jointed at the summit. Perianth white, withering-persistent, funnelform, 6-cleft into narrowly obovate segments. Stamens 6, inserted on the throat. Style equaling the perianth or slightly exserted; stigma disk-shaped. Capsule subglobose, loculicidal. Seeds numerous, horizontal, flattened, in 2 rows in the cells, jet black.—Species 1, deserts of Southern California and western Arizona. (Greek hesperos, western, and kallos, beauty.)

1. **H. undulata** Gray. DESERT LILY. Stem 1 to 2 feet high, 4 to 18-flowered; basal leaves somewhat fleshy, carinate, wavy-margined, 1 to 2 feet long and ¼ to ¾ inch wide, the margin more or less undulate; cauline leaves few, shorter; perianth 2¼ to 2¾ inches long, its tube half as long as the segments, the segments narrowly obovate, 4 to 6 lines wide, with a broad 5 to 7-lineate bluish-green band on the back; capsule 6 to 10 lines long, abruptly tipped with the persistent style base.

Sandy valleys or rocky hills: eastern Mohave Desert and the Colorado Desert. Western Arizona. Mar.-Apr.

Locs.—Minneola, *Hall & Chandler* 6829; Ludlow, *Jepson* 5502; Needles, *Ruby Warren*; Santa Maria Mts., *Schellenger*; Carrizo Creek, *T. Brandegee*; Salt Creek, *F. Stephens*. "Often spoken of as exceedingly rare, but during my 1905 journey into the desert it was sending up its stalks, laden with beautiful flowers, from every sand-patch between Mecca and Palo-verde on the Colorado Desert and between Bagdad and Newberry on the Mohave."—H. M. Hall in litt. Vallecito, *Jepson & Dutton* 8584.

Ref.—HESPEROCALLIS UNDULATA Gray, Proc. Am. Acad. 7:391 (1868), based on spms. from along the Colorado River (Jessup Rapids, *Newberry*, and Fort Mohave, *Cooper*).

9. ODONTOSTOMUM Torr.

Stem flexuous, branching, from a depressed corm. Leaves linear, mostly basal, sheathing the stem. Flowers in bracted racemes. Perianth with a narrow tube, its segments 6, soon reflexed. Stamens 6, inserted on the throat and alternating with as many short staminodia; the stamen opposite the lower outer segment stands alone and faces the remaining 5, which approximate each other on the upper side of the flower. Style 1; stigmas 3. Ovules 2 in each cell but only 1 maturing. Capsule obovate, 3-lobed, loculicidal.—Species 1. (Greek odous, tooth, and stoma, mouth, on account of the erect subulate filaments at the throat of the flower.)

1. **O. hartwegii** Torr. Erect, 5 to 10 inches high; basal leaves 3 to 9 inches long, 2 to 5 lines wide, with caudate-attenuate apex; racemes 2 to 5 inches long; bracts and bractlets subulate; perianth-tube 2 to 3 lines long, the reflexed segments as long or a little longer, narrowly oblong, 5 or 6-nerved.

Dry hard soil: Sierra Nevada foothills from Mariposa Co. to Butte Co.; local in the foothills of the middle and inner North Coast Ranges (Napa Co. and Tehama Co.); 400 to 1300 feet. May.

Locs.—St. Helena, *Jepson*; Manzanita Flat, Dibble Creek, w. Tehama Co., *Jepson*; Redding, *Heller* 7846; near Chico, *R. M. Austin*; Auburn, *Sonne*; Rose Sprs., Placer Co., *M. H. Gates*; Angels Camp, *Davy*; Chinese Camp, *Jepson* 6312; Agua Fria Cañon, Mariposa Co., *Congdon*.

Refs.—Odontostomum hartwegii Torr. Pac. R. Rep. 4:150, pl. 24 (1857), type loc. Ione Valley, *Bigelow*; Jepson, Erythea, 2:157 (1894), Fl. W. Mid. Cal. 114 (1901).

10. **SCHOENOLIRION** Torr.

Stem simple, scapose, this and the linear-elongated leaves from a tunicated bulb. Raceme elongated, densely many-flowered, with 1 or 2 short supplementary racemes below. Flowers on very short pedicels jointed at the summit. Perianth white, becoming scarious, persistent; segments 6, distinct, oblong, 3-nerved. Stamens 6, adnate to the base of the perianth-segments. Ovary ovate, short-stipitate, the cells 2-ovuled. Style persistent; stigma 3-cleft. Capsule loculicidal; seeds black.—Species 5, North America. (Greek schoinos, a rush, and lirion, a lily.)

Outer bulb-coat fibrous; perianth-segments linear-oblong.....1. *S. album.*
Outer bulb-coat membranous; perianth-segments lanceolate.....2. *S. bracteosum.*

1. **S. album** Dur. Scape ¾ to 5 feet high; leaves flat, ½ to 2 feet long, 2 to 6 lines wide; perianth white, tinged or tipped with green, pink or lilac, its segments linear-oblong, obtuse, 2½ to 3 lines long; stamens about equaling the perianth; ovary slightly 6-lobed; style slightly 3-cleft; capsule globose-ovate, 3 lines long.

Mountain swamps, northern Sierra Nevada from Plumas Co. to Mt. Shasta, thence southwest to Mendocino Co.; 3500 to 7000 feet. Southern Oregon. Apr.-July.

Locs.—Red Mt., n. Mendocino Co., *Bolander* 6559; Trinity Summit, *Davy* 5855; Forks of Salmon, *Jepson* 2082; Red Hill, Del Norte Co., *Jepson* 2902 (petals soon reflexed and the membranous margins involute along the green midvein; perhaps a distinct form); Quartz Valley, w. Siskiyou Co., *Butler* 790; Mt. Eddy, *Copeland* 3864; Sisson, *Jepson* 5789; Dead Horse Cañon, e. Siskiyou Co., *M. S. Baker*; Bear Valley Mts., Shasta Co., *M. S. Baker* 562; Colby, Butte Co., *R. M. Austin* 739; Snake Lake Valley, Plumas Co., *Hall* 9300.

Refs.—Schoenolirion album Dur. Jour. Phila. ser. 2, 3:103 (1855), type loc. Nevada City, *Pratten*. *Hastingsia alba* Wats. Proc. Am. Acad. 14:242 (1879).

2. **S. bracteosum** Jepson n. comb. Habit similar to S. album; perianth segments dull white, lanceolate, acuminate, 4 to 5 lines long, the stamens about half as long.

Bogs and stream banks, north boundary of Del Norte Co. and adjacent Oregon. Too little known to us.

Loc.—Highest Siskiyou Mts., Waldo-Crescent City road, *Cusick* 2912.

Refs.—Schoenolirion bracteosum Jepson. *Hastingsia bracteosa* Wats. Proc. Am. Acad. 20:377 (1885), type loc. Eight Dollar Mt., Curry Co., Ore., *Howell*.

11. **CAMASSIA** Lindl.

Stem slender, scapose, arising from a tunicated bulb, the linear leaves basal. Flowers dark blue or nearly white, in a simple raceme. Bracts scarious. Pedicels jointed at the summit. Perianth-segments 6, distinct, oblanceolate, nerved, somewhat spreading. Stamens 6, on the base of the perianth, shorter than the segments. Style filiform, slightly 3-cleft at apex, the lower part persistent. Capsule 3-lobed, loculicidally 3-valved. Seeds several in each cell.—Species 3, North America. (Quamash or camass, the name of the northwest Indians.)

Bibliog.—Coville, F. V., Technical Name of the Camas Plant (Proc. Biol. Soc. Wash. 11:61–65,—1897). Piper, C. V., Notes on Quamasia (Proc. Biol. Soc. Wash. 29:77–82,—1916).

Perianth-segments 3 or sometimes 5-nerved; buds gibbous on one side.....1. *C. quamash.*
Perianth-segments usually 5 (or 7 to 9)-nerved; buds not gibbous.....2. *C. leichtlinii.*

1. **C. quamash** Greene. CAMASS. Scape stoutish, 1 to 2½ feet high; raceme 5 to 25-flowered; flowers dark blue, rarely white; perianth-segments unequal, spreading unequally in 2 sets of 3 each, nearly 6 to 10 lines long, each twisted separately after blooming; capsule obtusely angled, its valves pinnately veined.

Wet meadows or wet bottoms, Sierra Nevada, 4500 to 6500 feet; high North Coast Ranges. North to British Columbia and east to Utah.

Locs.—Round Mdw., Giant Forest, *Jepson* 672; Pine Ridge, Fresno Co., *Hall & Chandler* (perianth-segments twisting over ovary); Little Yosemite, *Hall* 9047; Rancheria Mt., Yosemite Park, *Jepson* 4604; Truckee, *Sonne*; Modoc Co., *M. S. Baker*; Mt. Hull, *Hall* 9546a (twisting perianth!).

Refs.—CAMASSIA QUAMASH Greene, Man. Bay Reg. 313 (1894). *Phalangium quamash* Pursh, Fl. 1:226 (1814), type loc. Weippe, Ida., *Lewis*. *Quamasia quamash* Cov. Proc. Biol. Soc. Wash. 11:64 (1897). *Camassia esculenta* Lindl. Bot. Reg. t. 1486 (1832).

2. **C. leichtlinii** Wats. Similar to C. quamash; flowers dark blue to cream color; perianth-segments 10 to 12 lines long, spreading regularly in a perfect star, withering and twisting over the capsule like a bon-bon, at length deciduous as a whole; capsule oblong-obovate, slightly notched at apex, its valves closely veined horizontally.

Wet flats or grassy plains; Marin and Napa cos. to Humboldt Co., and easterly to Sierra Co. North to British Columbia.

Locs.—Inverness, *Jepson* 8302 (perianth-segments withering separately); Napa Valley, *Clara Hunt*; Red Mt., se. of Ukiah, *Jepson* 3035; Ft. Bragg, *W. C. Mathews*; Willow Creek, Trinity River, *Tracy* 3388; Sierra Valley, *Alma Ames*.

Refs.—CAMASSIA LEICHTLINII Wats. Proc. Am. Acad. 20:376 (1885). *Chlorogalum leichtlinii* Baker, Gard. Chron. ser. 2, 1:689 (1874), type collected by Jeffrey, probably in the Umpqua Valley, Ore., and not in "British Columbia," acc. Piper. *Camassia esculenta* var. *leichtlinii* Baker, Bot. Mag. t. 6287 (1877).

12. **CHLOROGALUM** Kunth.

Stem from a tunicated bulb, often tall, almost leafless, ending in a panicle of racemose branches. Leaves of the basal tuft long-linear. Bracts small and scarious. Pedicels jointed at the summit. Perianth white, purple or pinkish, persistent and at length twisted over the ovary; segments 6, distinct, spreading, ribbon-like, with 3 distinct but closely approximate nerves down the middle. Stamens 6, rather shorter than the segments and inserted on their bases. Style long-filiform, slightly 3-cleft at apex. Capsule broadly turbinate, 3-lobed, loculicidal, with 1 or 2 seeds in each cell.—Species 4, California and adjacent borders north and south. (Greek chloros, green, and gala, milk or juice.)

Perianth-segments rotate-spreading, 8 to 10 lines long; bulb with a heavy coat of coarse fibers; leaves ½ to 1½ inches broad; pedicels 3 lines long or more.....1. *C. pomeridianum*.

Perianth-segments somewhat spreading from above the base, 3 to 5 lines long; bulb with a membranous coat; leaves ¼ inch wide or less.

Pedicels shorter than the perianth; flowers white or pinkish.

Flowers white with yellowish-green lines; style included; ovary on a short stipe.....2. *C. angustifolium*.

Flowers white with rose-colored midnerve or pinkish; style exserted as ovary matures; ovary sessile.....3. *C. parviflorum*.

Pedicels as long or longer than the perianth; flowers blue or purplish; ovary sessile.....4. *C. purpureum*.

1. **C. pomeridianum** Kunth. SOAP PLANT. Plants 2 to 10 feet high, with ample spreading panicle; bulb 3 to 4 inches long and 1½ to 2 inches thick with a very dense coat of coarse brown fibres; basal leaves numerous, ¾ to 2½ feet long, ½ to 1½ inches broad, carinate, strongly undulate; pedicels slender, about 3 to 6 lines long; perianth-segments linear, 8 to 10 lines long, white, purple-veined, spreading widely; capsule 3 lines long, the valves pinnately nerved.

Dry open low hills and plains, Sierra Nevada foothills, Great Valley, Coast Ranges, south to cismontane Southern California, and north to southern Oregon.

Absent from the Colorado and Mohave deserts and the arid region east of the Sierra Nevada, and the Redwood belt. July-Aug.

Locs.—Bear Valley, Nevada Co., *Jepson*; Gwin Mine, Calaveras Co., *Jepson*; Hetch-Hetchy, *Jepson*; North Fork Kaweah River, *Jepson*; Hupa Valley, *P. E. Goddard*; Mt. Konocti, Lake Co., *Jepson*; Mt. Tamalpais, *E. Mulliken* 72; Little Oak, Solano Co., *Jepson*; Coyote Creek, Santa Clara Co., *Jepson*; San Luis Obispo, *Summers* 825; Lower Rubio Cañon, *Peirson* 10; San Bernardino, *Parish*.

Refs.—CHLOROGALUM POMERIDIANUM Kunth. Enum. Pl. 4:682 (1843); Torr. Bot. Mex. Bound. 218, pl. 60 (1859); Wats. Bot. Cal. 2:159 (1880); Jepson, Fl. W. Mid. Cal. 121 (1901). *Anthericum pomeridianum* Ker. Bot. Reg. t. 564 (1821), type not given. *Laothoe pomeridiana* Raf. Fl. Tellur. 3:53 (1836).

2. **C. angustifolium** Kell. Plants $1\frac{1}{6}$ to 2 feet high; bulb-coats membranous, light reddish-brown; basal leaves 4 to 12 inches long, 1 to 2 or 3 lines broad, becoming revolute; panicle with few ascending branches; pedicels about 2 lines long; perianth funnelform-campanulate, the segments oblong-linear, 4 to 5 lines long, white with yellowish-green veins; ovary on a short stipe.

Lower foothills of the Sierra Nevada, Calaveras Co. north to Shasta Co., thence south in the inner Coast Range to Mendocino Co.

Locs.—Milton, *Davy* 1229; Ione, *Braunton* 1005; Blue Ravine, Eldorado Co., *K. Brandegee*; Redding, *Hall & Babcock* 4003; Round Valley (Zoe, 4:159).

Refs.—CHLOROGALUM ANGUSTIFOLIUM Kell. Proc. Cal. Acad. 2:104, fig. 30 (1863), type loc. Shasta, *Veatch*; Wats. Bot. Cal. 2:160 (1880); Jepson, Fl. W. Mid. Cal. 121 (1901). *Laothoe angustifolia* Greene, Leafl. 1:91 (1904).

3. **C. parviflorum** Wats. Plants 1 to 2 feet high; bulb 1 inch in diameter; basal leaves grass-like (2 to 3 lines broad); pedicels short, 1 or rarely 2 lines long; flowers pinkish or white with rose-colored midnerve; perianth-segments oblong-lanceolate, spreading from above the base, 3 or sometimes 4 lines long; style exserted as ovary matures; ovary broad and obtuse, sessile.

Cismontane Southern California in Riverside and San Diego cos., from the coast inland 24 to 35 miles.

Locs.—Menifee, Riverside Co., *E. Foster*; Oceanside, *Parish* 4444; San Diego, *Jepson* 1600; Alpine, *T. Brandegee*.

Refs.—CHLOROGALUM PARVIFLORUM Wats. Proc. Am. Acad. 14:243 (1879), type loc. El Cajon Valley, San Diego Co., *D. Cleveland*. *Laothoe parviflora* Greene, Leafl. 1:91 (1904).

4. **C. purpureum** Brandegee. Plants 14 to 20 inches high; bulbs light-colored, ovoid, $\frac{3}{4}$ to 1 inch in diameter; basal leaves narrowly linear, 1 to 2 lines wide, undulate; pedicels as long or longer than the (3 lines long) perianth; perianth-segments spreading from above the base, oblong-ovate, blue or purplish with 3 darker midveins; stamens about equaling the segments; style sometimes slightly exserted in old flowers; ovary sessile.

Western Monterey Co. June.

Locs.—Jolon, *Hall* 10019; Milpitas Ranch, *Eastwood*.

Refs.—CHLOROGALUM PURPUREUM Brandegee, Zoe 4:159 (1893), type loc. Santa Lucia Mts., *W. Vortriede*. *Laothoe purpurea* Greene, Leafl. 1:91 (1904).

13. **ALLIUM** L. WILD ONION

Stem scapose, from a tunicated or sometimes rhizome-like bulb or from a corm, with basal leaves, and bearing an unbel or head of flowers subtended by 2 or 3 thin whitish or scarious bracts. Herbage with the characteristic taste and odor of onions. Leaves narrow and plane, or convolute-filiform or terete. Perianth of 6 distinct or nearly distinct equal 1-nerved segments, campanulate or spreading. Stamens inserted on the base of the segments; filaments often dilated below. Ovules 2 (rarely several) in each cell; style filiform, persistent; stigma simple or 3-parted. Capsule obovate or globose, obtusely 3-lobed, often crested; seeds 1 or 2 in each cell, black, wrinkled.—Species 250, north temperate zone. (Ancient Latin name of garlic.)

A. Scape terete; leaves 1 to several, linear, filiform or terete.

1. *Plants with rootstocks and bulbs.*

Rootstock crowned by the bulb, more or less persistent; bulb narrowly oblong or elongated ovoid, heavily sheathed with the bases of several leaves.
Scapes 1½ to 3 feet high; bulbs white or light-colored, narrowly oblong, ½ to 1¼ inches broad....1. *A. validum.*
Scapes 8 to 12 inches high; bulbs generally deep red, elongated ovoid, ½ to ¾ inch broad....2. *A. haematochiton.*
Rootstock slender, horizontal, bearing terminally one or few corms and giving rise to an erect scape; corm short-ovoid or round....3. *A. unifolium.*

2. *Plants without rootstocks; bulb ovoid or globose; leaves deciduous above outer bulb-coats.*

Bulb-coats with indistinct reticulation or none.
Leaves terete or sub-terete, solid; ovary crests conspicuous.
Scapes 12 to 20 inches high; bulbs pinkish; leaves 1 or 2....4. *A. intactum.*
Scapes 2 to 8 inches high; bulbs reddish-brown; leaf solitary.
Leaves not coiled at tip; Southern California.
Perianth-segments lanceolate-attenuate; ovary crests emarginate....5. *A. parryi.*
Perianth-segments ovate-lanceolate; ovary crests more or less fimbriate.
Scapes mostly slender; perianth-segments 3 to 5 lines long, usually recurved at tip, sometimes spreading; mostly of the desert slopes....6. *A. fimbriatum.*
Scapes stout; perianth-segments closely erect, straight at tip, 6 to 7 lines long; high San Gabriel Mts....7. *A. peirsonii.*
Leaves coiled at tip; east side of the Sierra Nevada....8. *A. atrorubens.*
Leaves plane.
Scapes 4 to 15 inches high; ovary crests conspicuous; perianth-segments broadly ovate to lanceolate.
Flowers 5 to 6 lines long; ovary crests twice as long as the ovary....9. *A. anserinum.*
Flowers 3 to 4 lines long; ovary crests shorter than the ovary.
Perianth-segments acuminate, rose-color.
Scapes solitary....10. *A. campanulatum.*
Scapes commonly in pairs....11. *A. bisceptrum.*
Perianth-segments acute, pinkish to white....12. *A. sanbornii.*
Scapes ¼ to 2½ inches high; ovary crests evident to obscure; perianth-segments lanceolate to oblong, obtuse to acuminate.
Stamens shorter than the perianth; Sierra Nevada....13. *A. tribracteatum.*
Stamens equaling or exceeding the perianth; Southern California....14. *A. burlewii.*

Bulb-coats with distinct reticulation.
Reticulation of bulb-coats undulate-horizontal.
Leaves 2; bulbs gray; ovary without crests....15. *A. hyalinum.*
Leaves several; bulbs deep red; ovary broadly crested....16. *A. amplectens.*
Reticulation of bulb-coats close, strongly serrate-horizontal.
Ovary crests minute, central.
Outer perianth-segments only slightly wider than the inner.
Perianth commonly pink; pedicels equal, ¼ to ½ inch long; interior....17. *A. serratum.*
Perianth rose-purple; pedicels unequal, ¼ to ¾ inch long; maritime....18. *A. dichlamydeum.*
Outer perianth-segments twice as wide as the inner and slightly longer; perianth rose-purple; pedicels unequal, ¾ to 1¼ inches long....19. *A. peninsulare.*
Ovary crests broad, rounded; perianth-segments glandular-denticulate....20. *A. bolanderi.*
Reticulation of bulb-coats coarse quadrate to hexagonal.
Perianth-segments deep rose-color, acuminate, the margins undulate-serrulate; pedicels ½ to 1 inch long....21. *A. acuminatum.*
Perianth-segments pinkish to rose-color, acute, the margins entire; pedicels ¼ to ½ inch long....22. *A. lacunosum.*

B. Scape much flattened and 2-edged or narrowly winged; leaves usually 2, broadly linear or falcate.

Perianth-segments narrowly lanceolate, long acuminate, or becoming filiform-subulate; stamens nearly equaling segments or exserted; ovary not crested; bulb-coats without reticulation; northern Sierra Nevada....23. *A. platycaule.*

Perianth-segments ovate-lanceolate, acute to acuminate; stamens ½ to ¾ as long as, or sometimes equaling, the segments.
Ovary crests consisting of a curved ridge; bulb-coats mostly with faint reticulation; northern Sierra Nevada.
Filaments dilated at base but distinct....24. *A. anceps.*
Filaments united by thin dilated bases into a sort of cup....25. *A. modocense.*
Ovary with ridges of the lobes produced above into prominent crests; filaments distinct; bulb coats not reticulated; Coast Ranges.
Umbels loose (pedicels 6 to 13 lines long)....26. *A. falcifolium.*
Umbels more compact (pedicels 4 to 7 lines long)....27. *A. breweri.*

1. **A. validum** Wats. SWAMP ONION. Scape stout, 2-edged above, 3 to 6 lines in diameter, 1½ to 3 (or 3½) feet high; bulb ½ to 1¼ inches thick and 1½ to 2 times as long, crowning a very stout rootstock; roots thick and coarse; bulb-coats white to light reddish-brown, prominently ribbed, continuous with the broad leaves, these 4 to 6 lines wide, 1 to 2 (or 3) feet long; perianth-segments 3 to 6 lines long, lanceolate-acuminate, rose-color to nearly white; stamens and style usually exserted; capsule large, subglobose, not crested.

Wet meadows, Sierra Nevada north to Siskiyou Co., thence southerly to Trinity Co.; 4000 to 9000 feet. Common. Also in Oregon.

Locs.—Garfield Forest, Sequoia Park, *Jepson* 4661; Farewell Gap, *Jepson* 1145; Lake Merced, Yosemite Park, *Jepson* 3214; Kennedy Mdws., *A. L. Grant* 178; Silver Lake, Amador Co., *Mulliken* 139; Suzy Lake, El Dorado Co., *Jepson* 8184; Donner Lake, *Sonne*; Warner Mts., *L. S. Smith* 1131; Cedar Spr., Mt. Shasta, *Jepson*; Shackelford Creek, w. Siskiyou Co., *Butler* 112; Twin Lakes, Trinity Co., *Eastwood.*

Ref.—ALLIUM VALIDUM Wats. Bot. King, 350 (1871), type loc. Mono Pass, *Bolander* 6248.

2. **A. haematochiton** Wats. Scape stout, flexuous, 7 to 12 inches high; bulb elongated-ovoid, ½ to ¾ inch broad, its coats usually deep red, rarely pale pink; leaves many, abruptly narrowing or filiform above the broad sheaths; pedicels numerous, ¼ to 1 inch long; perianth-segments deep rose-color (or often nearly white) with darker midnerve, broadly ovate-acute, 3 to 4 lines long; filaments ⅔ as long as the perianth-segments, narrowly subulate, with adnate deltoid bases; ovary white, truncate with very short rounded or undulate dark red crests.

Dry hills and mountain slopes from San Luis Obispo Co. to San Diego Co.

Locs.—San Luis Obispo, *Summers;* Lockwood Valley, Mt. Pinos, *Hall* 6333; Banning, *R. J. Smith* 300; Strawberry Valley, San Jacinto Mts., *Hall* 2096; Palomar, *Jepson* 1487; La Mesa, San Diego Co., *Jepson* 6679.

Refs.—ALLIUM HAEMATOCHITON Wats. Proc. Am. Acad. 14:227 (1879), type loc. San Luis Obispo, *Brewer* 462; Abrams, Fl. Los Ang. 84 (1904).

3. **A. unifolium** Kell. Scape stout, 1 to 2 feet high, rising from a deeply seated short horizontal rootstock bearing one or a few corms, only the rootstock or base of scape rooting; reticulation of corm coats irregular to vertical undulate; leaves 4 or 3; bracts 2, large, acuminate, membranous; umbels 10 to 30-flowered, the pedicels 1 to 1½ inches long; flowers lavender-pink; segments broadly oblong-ovate, 5 to 7 lines long, ⅓ longer than the stamens and style; ovary not crested, but with quadratish lobes.

Rich moist lands in the valleys or open hills: Coast Ranges, 20 to 400 feet, from Monterey Co. north to Humboldt Co. Local.

Biol. Note.—The stem arises from a corm which through exhaustion becomes a rootstock as is evidenced by the husk of the former corm which for a time surrounds it. The rootstock sends out two prongs in opposite directions or nearly, each developing a corm. Apparently these new corms become independent the next season, each sends up a stem, and at the same time develops two new corms as the parent corm becomes depleted.

Locs.—Pacific Grove, *Heller* 6845; Mt. Diablo, *Jepson* 7588; Berkeley and Mt. Tamalpais, acc. Behr; Conn Valley, Napa Co., *Jepson*; Ft. Bragg, *W. C. Mathews* 51; White Thorn Valley, Mattole River, *Tracy* 5004; Eureka, *Tracy* 4078.

Refs.—ALLIUM UNIFOLIUM Kell. Proc. Cal. Acad. 2:112, f. 35 (1863), type loc. Oakland; Wats. Bot. King, 486, pl. 36, figs. 9–10 (1871); Baker, Bot. Mag. t. 6320, figs. 1–4 (1877); Behr, Fl. Vic. S. F. 287 (1888); Jepson, Fl. W. Mid. Cal. 119 (1901). Var. LACTEUM Greene, Pitt. 2:55 (1890), type loc. San Luis Obispo Co., *Lemmon.* Stouter and more succulent; perianth white.—Ex. char.

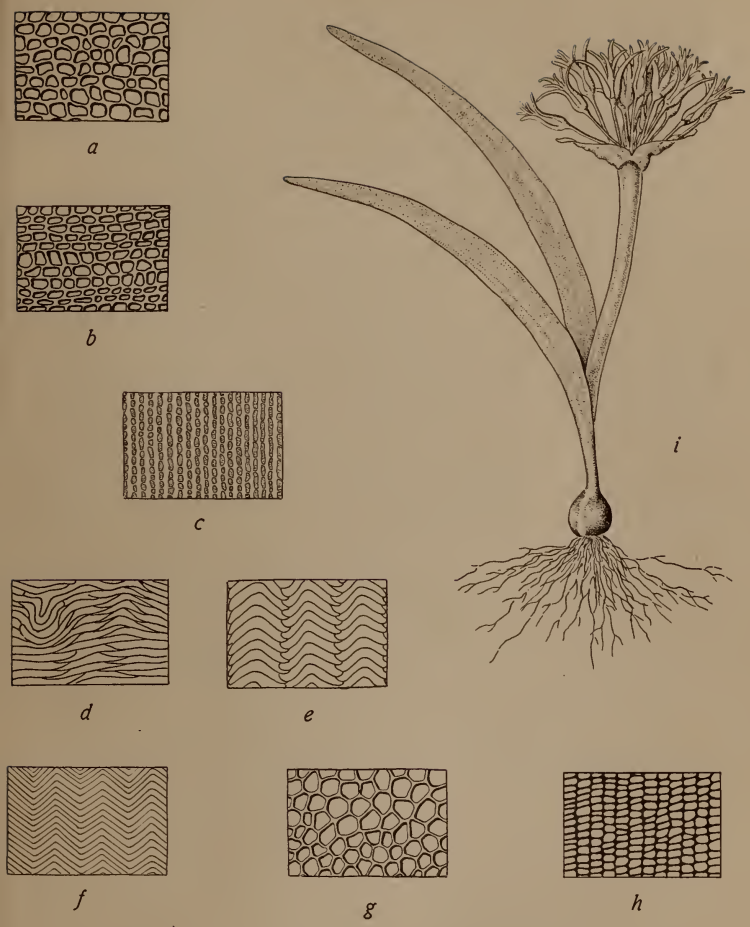

Fig. 47. Bulb coat reticulations in Allium: *a*, A. PARRYI Wats., × 20. *b*, A. FIMBRIATUM Wats., × 20. *c*. A. SANBORNII Wood, × 10. *d*, A. HYALINUM Curran var. PRAECOX Jepson, × 10. *e*, A. PENINSULARE Lemmon, × 10. *f*, A. BOLANDERI Wats., × 10. *g*, A. ACUMINATUM Hook., × 5. *h*, A. LACUNOSUM Wats., × 10. *i*, habit of A. FALCIFOLIUM H. & A., × ½.

4. **A. intactum** Jepson n. sp. Scape 12 to 20 inches high, stiff, slightly flexuous or erect; bulb-coats numerous, pinkish, the reticulation vertical, minutely rectangular; leaves 1 or 2, terete, solid, sheathing the stem 3 to 6 inches, the sheath entire (not split down); bracts 3, large, ovate-acuminate with attenuate tips; umbels round, densely flowered; pedicels slender, ½ to ¾ inch long; perianth-segments pink to rose-color with deeper midnerve, rather thin, lanceolate-acuminate, erose, 2 lines long; stamens equaling or exceeding the perianth; filaments opposite the inner segments with long narrow triangular bases adnate to the petal for almost half their length, the alternate filaments with short deltoid bases; style exserted, stigmas 3-parted; ovary with very thin walls and 6 conspicuous thin crests; crests as long as the ovary; capsule one-seeded.—(Scapus rigidus, leviter flexuosus vel erectus, unc. 12–20 altus; reticulum tunicae bulbi minute rectangulare ad perpendiculum directum; folia 1–2, teretia, non cava; stamina perianthio aequantia vel hoc superantia; cristae ovarii 6 conspicuae tenues aequantes ovario; capsula monosperma.)

Placer Co. (Cape Horn, *K. Brandegee*, type); not otherwise known.

5. **A. parryi** Wats. (Fig. 47a.) Scape 3 to 6 inches high; bulb coats reddish brown, quadratish-reticulate; leaf solitary, as long as or slightly longer than the scape, the sheath entire, about ½ as long as the scape; pedicels 4 to 8 lines long; perianth-segments lanceolate, acuminate, erect, 3 to 4 lines long, white to pale rose; stamens opposite the outer segments about ¾ their length; ovary crests conspicuous, emarginate to erose.

San Bernardino Mts., 6500 feet.

Locs.—Bear Valley, *Parish* 3761, 3078. The genuine form has been collected only in the San Bernardino Mts., but the variants of A. fimbriatum simulate it very closely in a continuous series.

Ref.—ALLIUM PARRYI Wats. Proc. Am. Acad. 14:231 (1879), type loc. San Bernardino Co., *Parry* 390 (specifically in Big Bear Valley acc. to Parish).

6. **A. fimbriatum** Wats. (Fig. 47b.) Scape 2 to 3 inches high, the leaves terete, narrow (½ to 1 line broad), exceeding the scape; sheaths entire; pedicels 2 to 6 lines long; bracts 2, sometimes 3 or 4; perianth dark to pale rose, its segments ovate-lanceolate, 4 to 5 (or 6) lines long, erect but the tips more or less recurving; stamens ½ as long as the segments; ovary crests 2 to each lobe, finely toothed or fimbriate to nearly entire.

Ranges bordering the desert from San Diego Co. north through the Mohave Desert.

Locs.—Mt. Pinos, *Hall* 6557; Mt. Soledad, *Johnston* 2251; Providence Mts., *Munz, Johnston & Harwood* 4218; Ord Mt., *Jepson* 5879; Vandeventer, San Jacinto Mts., *Jepson* 1461; Blair Valley, e. San Diego Co., *Jepson* 8693; Vallecito, *Jepson* 8537; Jacumba, *T. Brandegee*.

Var. **mohavense** Jepson n. var. Perianth-segments ovate, bluntish or rounded, 3 lines long, commonly pale pink; ovary crests sparingly toothed or emarginate.—(Segmentis perianthium late ovatis obtusis, erectis, apice non recurvatis, lin. 3 longis; cristis ovarium subintegris.)—Eastern Mohave Desert (Calico Mts., *Jepson* 5403, type.)

Var. **aboriginum** Jepson n. var. Umbels relatively loose, the pedicels 8 to 10 lines long; ovary crests long and thin, toothed.—(Umbella sublaxa, pediculi lin. 8–10 longi; cristis ovarium longis tenuibus dentatis.)—Southern Sierra Nevada from Fresno Co. to Tulare Co., and inner North Coast Range.

Locs.—Pine Ridge, Fresno Co., *Hall & Chandler* 201; Erskin Creek, *Purpus* 5332; Walker's Basin, *T. Brandegee*; Indian Valley, ne. Lake Co., *Jepson* 8995 (type).

Refs.—ALLIUM FIMBRIATUM Wats. Proc. Am. Acad. 14:232 (1879), type loc. Mohave River, Palmer. *A. parishii* Wats. l.c. 17:380 (1882), type loc. Cushenberry Sprs., *Parish*. Var. MOHAVENSE Jepson. Var. ABORIGINUM Jepson.

A. DAVISIAE Jones, Contrib. 12:78 (1908), type loc. granite rocks, Victorville, Mohave Desert, is probably close to A. fimbriatum var. mohavense; it has 2 bracts; perianth-segments oval, acute, rather rigid, white, green ribbed, ½ longer than the stamens; but the ovary is not crested (ex. char.).

A. DECIPIENS Jones, Contrib. 10:16 (1902); *A. inyoensis* Jones l.c. 10:86, type loc. "Summit, Owens Valley, 7000 ft.," seems near A. fimbriatum, but we have seen no specimens.

7. **A. peirsonii** Jepson n. sp. Scape stout, 3 to 4 inches high; leaf 1, terete or teretish, 1 to 2½ lines thick, 4 to 8½ inches long above the sheath (much exceeding the scape); flowers many in a compact umbel, the pedicels 3 to 4 (or 5) lines long; bracts 2; perianth reddish or light pink, 6 to 7 lines long, the segments straight, stamens about ¾ the length of the perianth-segments; ovary crests prominent, slender, often as long as the ovary, toothed at apex.—(Scapus robustus, unc. 3-4 altus; folium singulare, teres vel subteres, lin. 1–2½ diametro, lin. 4–8½ longum; umbella compacta, multiflora; perianthium lin. 6–7 longum, segmentis rectis; cristis ovarium conspicuis gracilibus, apice dentatis saepe aeque longis ac ovarium.)

Rock slides, high cañons of the San Gabriel Mts., 5350 to 9400 feet.

Locs.—Mt. San Antonio, *Peirson* 3 (type); San Antonio Cañon (head), *Johnston* 1446; Rock Creek (head), *Peirson* 267; divide betw. Mt. Lowe and Mt. Markham, *Peirson* 1.

8. **A. atrorubens** Wats. Three to 4 inches high; bulb-coats without distinct reticulation; pedicels 15 to 20, 6 to 7 lines long; bracts 2 or 3; leaves coiled at tip; flowers dark or lead-purple; perianth-segments stiff, long-acuminate, 4 to 5 lines long.

East side of the Sierra Nevada.

Locs.—Reno, Nev., *Cowgill*. Owens Valley, Cal., acc. Jones (Contrib. 10:16), who says the corms produce runners with brilliant shiny bulblets strung along them.

Ref.—ALLIUM ATRORUBENS Wats. Bot. King, 352, pl. 38, figs. 4–5 (1871), type loc. west Humboldt to the Havallah Mountains, Nev.

9. **A. anserinum** Jepson n. sp. Scape terete, 5 to 6 inches high; leaf one, flat; umbel about 20-flowered; pedicels about 4 lines long; perianth purplish or pinkish, its segments oblong-ovate, 5 to 6 lines long, spreading at tip; stamens about ⅔ as long as the perianth; ovary-cells with 2 crests; crests oblongish, much lacerate or laciniate, twice as long as the ovary; stigma slightly 3-cleft.—(Scapus teres, unc. 5–6 altus; folium singulare planum; ovarium 2-cristatis lobis; cristae suboblongae, multum laceratae, duplo longiores ovario.)

Modoc Co.

Loc.—Goose Lake Valley, *R. M. Austin* (type).

10. **A. campanulatum** Wats. Scape 4 to 7 or 11 inches high, erect, often flexuous; leaves 2; umbel 10 to 50-flowered; pedicels 4 to 15 lines long; flowers somewhat campanulate, pink or rose-color; perianth-segments broadly ovate, acute or short-acuminate, 3 to 4 lines long, nearly equal, ¼ longer than the very slender stamens and style; filament bases nearly equal; ovary prominently crested, the crests somewhat horizontal.

Usually in dry places, Sierra Nevada, south to Tehachapi, north to Shasta Co., thence southerly to eastern Humboldt Co., 3000 to 6000 feet. Passing into var. bidwelliae at the higher altitudes. The accumulation of material has also tended to weaken the distinctions betwen A. campanulatum and A. bisceptrum but we continue to retain the two as species.

Locs.—Tehachapi, *Greene*; Marble Fork, Sequoia Park, *Jepson* 648; Huntington Lake, Fresno Co., *A. L. Grant* 1045; Volcano Creek, Tulare Co., *Jepson* 4928a; Hazel Green, *Hall & Babcock* 3403a; Sonora Pass, *A. L. Grant*; South Fork Bear Creek, Shasta Co., *Hall & Babcock* 4145; Buck Mt., Humboldt Co., *Tracy* 2836.

Var. **bidwelliae** Jepson n. comb. Perianth-segments ovate at base, long-acuminate above.—Sierra Nevada and inner North Coast Range, 6000 to 9000 feet. Western Nevada to Oregon.

Locs.—Horse Mdw., Tulare Co., *Hall & Babcock* 5136; Benson Lake, Yosemite Park, *Jepson* 4518; Belle Mdw., Tuolumne Co., *Jepson* 6470; Lake Lucile, Eldorado Co., *Hall & Chandler* 4667; Hot Springs Valley, Plumas Co., *Jepson* 4077; Mt. Hull, Lake Co., *Hall* 9536.

Refs.—ALLIUM CAMPANULATUM Wats. Proc. Am. Acad. 14:231 (1879), based on Mt. Bullion, Mariposa Co., *Bolander* 4943, and Plumas Co., *M. E. P. Ames*; Hall, Univ. Cal. Publ. Bot. 4:196 (1912). Var. BIDWELLIAE Jepson. *A. bidwelliae* Wats. l.c., type loc. "above Chico," *Annie Bidwell*. *A. austinae* Jones, Contrib. 10:85 (1902), found at Summit and Castle Peak, crests very prominent, spreading from the summit of the ovary "like a rotate corolla."—Ex. char.

11. **A. bisceptrum** Wats. Scapes often stout, commonly in pairs (or 3s or 4s), but frequently solitary, 5 or 10 to 14 inches high; bulb-coats light-colored with indistinct reticulation; flowers few to many, rose-colored; perianth-segments 3 to 4 lines long, unequal, oblong-lanceolate, acuminate, exceeding the stamens, the inner more narrow, their bases hidden by the broad outer ones; filaments with unequal deltoid bases, those opposite the inner perianth-segments with bases expanded and adnate, the alternate ones with mainly free bases; ovary crests 2 or 3 to each lobe, very thin, conspicuous, sometimes much toothed.

East of the Sierra Nevada crest (from Tulare Co. to Placer Co. and north to Modoc Co.), also local on the west slope, and very local in the high inner Coast Ranges; San Bernardino Mts. Also in Nevada.

Locs.—Alta Mdws., Tulare Co., *K. Brandegee*; Hazel Green, *Jepson*; Merced Big Trees, *Jepson*; Andrews Camp, Inyo Co., *K. Brandegee*; Walker Lake, Mono Co., *Jepson* 4448; Kennedy Lake, Tuolumne Co., *A. L. Grant* 256; mts. of e. Placer Co., *Sonne*; New Pine Creek, Warner Mts., *L. S. Smith*; South Yolo Bolly, *Jepson*; Frazier Mt., Ventura Co., *Hall* 6607; San Bernardino Mts., acc. *Parish* (Pl. World, 20:208).

Refs.—Allium bisceptrum Wats. Bot. King, 351, pl. 37, figs. 1–3 (figure of the flower faulty as respects the base of the filaments), (1871), based on spms. from Downieville, *Bigelow*, Carson City, *Anderson* 288, Washoe Valley, *Stretch* 89.

12. **A. sanbornii** Wood. (Fig. 47c.) Scape 10 to 14 inches high; outer bulb-coats light-colored, reticulation vertical, minutely white dotted or undulated rectangular; pedicels 3 to 8 lines long, perianth-segments white or pinkish (thin and lax in fruit), 2½ to 3 lines long, the outer broadly ovate-lanceolate, the inner narrower; stamens and style ⅔ the length of the segments ("exserted" in the type); filaments opposite inner segments with adnate bases 1½ to 2 times the height of the others; capsule thin-walled, 6-crested, the crests oblong or sometimes lanceolate, conspicuous.

Sierra Nevada from Yuba Co. to Mariposa Co., 1500 to 4000 feet; Santa Lucia Mts. Rare.

Locs.—The type of this species we have not seen, but the following specimens, representing a distinctive natural unit, evidently belong here: Sierra Nevada: Brush Creek, Butte Co., *K. Conger*; Italian Bar, Tuolumne Co., *Jepson* 6375; Bluett's Pt., Tuolumne Co., *A. L. Grant* 709; Devil's Gulch, Mariposa Co., *Congdon*. Coast Ranges: Cold Spr., Big Sur River, *Jepson* 2594.

Var. **congdonii** Jepson n. var. Perianth-segments elliptic-acuminate, very thin, erose; outer bulb-coat with vertical reticulation, not undulated.—(Segmenta perianthii elliptico-acuminata tenuissima erosa; tunica bulbi exterior ad perpendiculum reticulata non undulata.)—Mariposa Co. (Benton Mills Road, *Congdon*, type; Josephine Mine, *Congdon*).

Refs.—Allium sanbornii Wood, Proc. Acad. Phila. 20:171 (1868), type loc. Foster's Bar, N. Fork Yuba River, *S. S. Sanborn*; Wats. Bot. King, 486, pl. 37, fig. 7 (1871), Proc. Am. Acad. 14:229 (1879). Var. congdonii Jepson.

13. **A. tribracteatum** Torr. Scape rising above the ground only ¼ to 2½ inches, generally slender, channeled and more or less distinctly 4-angled, 2 angles often more prominent; bulb-coats white with minute more or less distinct oblong to hexagonal reticulation; bracts usually 3, short-obovate, acuminate; leaves 1 or 2, linear-lanceolate, 1½ to 5 times as high as the scape; perianth-segments 2 to 4 lines long, narrowly ovate, acuminate to obtuse, silver-white to pinkish with brown or purple midnerve; filaments ⅔ to almost as long as the segments; ovary strongly and angularly 3-lobed, its crests varying from prominent to obscure or none, usually consisting of 2 rounded ridges, with a longitudinal channel between them.

Granite sand, Sierra Nevada, 8000 to 9500 feet, from Lassen Peak south to Kern Co.

Locs.—Pah Ute Peak, *Purpus* 5333; Macomb Ridge, Yosemite Park, *Jepson* 4558; Tuolumne Mdws., *Jepson* 4474; Conness Creek, Tuolumne River, *Jepson* 3361; Sunrise Trail to Lake Merced, *Jepson* 3166 (bracts 2); Hull's Mdw., Tuolumne Co., *A. L. Grant* 1229. Passes into

the var. **parvum** Jepson n. comb. Perianth-segments oblong, obtuse.—High Sierra Nevada (7500 to 10,500 feet): Mt. Lyell, *Jepson* 3332 (bracts 2); El Capitan, *Jepson* 4360 (bracts 2 or 3); Nellie Lake, Fresno Co., *A. L. Grant* 1019. Also in the Washoe Mts., Nev., Var. **andersonii** Wats.—Perianth-segments oblong, obtuse, 3 to 5 lines long; bracts 2, rose-purple, broadly ovate, acuminate.—Truckee River basin (Prosser Creek, Nevada Co., *Sonne*; Donner Lake, *Sonne*. Near Carson City, Nev., *Anderson*. *Hall & Chandler* 442 (North Forks Kings River) is similar to the Truckee River plants, but the pedicels are longer (5 to 7 lines).

Refs.—ALLIUM TRIBRACTEATUM Torr. Pac. R. Rep. 4:148 (1856), type loc., Duffield's Ranch, east of Sonora, Tuolumne Co.; Wats. Bot. King, 353, 488, pl. 38, figs. 6–7 (1871). Var. PARVUM Jepson. *A. parvum* Kell. Proc. Cal. Acad. 3:54, fig. 13 (1863), type loc. "Washoe, Nev.," *Veatch*; Wats. Proc. Am. Acad. 14:232 (1879). *A. obtusum* Lemmon, Pitt. 2:69 (1890), type loc. Gold Lake, Plumas Co. *A. parvum* var. *brucae* Jones, Contrib. W. Bot. 10:12 (1902), type loc. Yankee Hill, Butte Co., *C. C. Bruce*. *A. ambiguum* Jones, l.c. 18, type loc. Summit, Nevada Co., *Jones*. Var. ANDERSONII Wats. Bot. King, 353, 488, type loc. near Carson City, Nev., *Anderson* 63, 286 (1871).

14. **A. burlewii** Davidson. Resembling A. tribracteatum; bracts 3 to 5, ovate, acute, with connate bases; leaf solitary, twice the height of the inflorescence; perianth-segments lanceolate-attenuate, 4 to 6 lines long; stamens equal to segments or slightly exserted; style exserted 1 to 2 lines.

Mountains of Southern California, 6700 to 9000 feet.

Locs.—Mt. Pinos, *Hall* 6514; Mt. San Antonio, *Peirson* 2, 4, 266; San Jacinto Mts., *H. W. Anthony*.

Refs.—ALLIUM BURLEWII Davidson, Bull. S. Cal. Acad. 15:17 (1916), type loc. summit Mt. San Antonio, *Fred Burlew*. *A. johnstonii* Jones in litt.

15. **A. hyalinum** Curran. Scape 6 to 14 inches high; bulb-coats gray, with horizontal, strongly undulate to serrate reticulation; leaves generally 1 or 2, linear, channeled; bracts ovate, acuminate; pedicels 6 to 11 lines long; perianth-segments lanceolate to ovate, obtuse or acute, pale pink to white, becoming thin, hyaline and spreading; filaments subulate from a narrowly deltoid base, unequal, ½ to ⅔ the length of the perianth-segments; capsule not crested.

Rocky slopes, Sierra Nevada, 500 to 2600 feet, from Eldorado Co. to Kern Co.

Locs.—Salmon Falls, Eldorado Co., *K. Brandegee*; Drytown, Amador Co., *G. Hansen*; Mariposa. *Congdon*; Sequoia Park, *Walter Fry* 130, 398; Kernville, *T. Brandegee*; Keene, *Heller* 7805.

Var. **praecox** Jepson n. comb. (Fig. 47d.) Scape stouter, leaves broader; pedicels mostly ¾ to 1¼ inches long; reticulation of inner bulb-coats contorted-undulate; perianth-segments acute, longer, with rose-purple midnerve.—San Bernardino to San Diego Co.; Santa Barbara Islands; northern Lower California; Slover Mt., *Parish* 4667; El Cajon, *T. Brandegee*; Santa Cruz Isl., *T. Brandegee*.

Var. **hickmanii** Jepson n. comb. Like the species but scape shorter (3 to 6 inches high); leaves 2 to several, filiform; perianth-segments less hyaline, the midnerve rose-pink.—(Scapus brevior, unc. 3–6 altus; folia filiformia, duo vel plura; segmentis perianthium minus hyalinis.) —Monterey, *E. K. Abbott* (type).

Refs.—ALLIUM HYALINUM Curran, Bull. Cal. Acad. 1:155 (1885), type loc. McKewen's Ranch, near Salmon Falls, Eldorado Co., *Curran*; Wats. Proc. Am. Acad. 24:87 (1889) in part. Var. PRAECOX Jepson. *A. praecox* T. Brandegee, Zoe 5:228 (1908), type loc. San Diego, *T. Brandegee*. *A. campanulatum* Parish, Erythea, 3:60 (1895), not Wats. *A. peninsulare* Jones, Contrib. 10:22 (1902), not Lemmon. Var. HICKMANII Jepson. *A. hickmanii* Eastw. Bull. Torr. Club 30:483 (1903), type loc. between Monterey and Pacific Grove, *Eastwood*.

16. **A. amplectens** Torr. Scape slender, 6 to 13 inches high; bulb-coats commonly reddish, with a delicate transversely sinuate or serrate reticulation, the vertical lines especially also minutely sinuous; leaves narrow and becoming convolute-filiform above the sheathing base; bracts 3, short, abruptly acute; umbel erect, usually dense; pedicels 25 to 35, 3 to 8 lines long; flowers white or nearly so, the oblanceolate acuminate segments 3 to 4 lines long, more or less exceeding the stamens and style; ovary crests low, broad.

Wet often rocky slopes at lower and middle altitudes (1000 to 4000 feet): North Coast Ranges and Sierra Nevada. North to Oregon.

Locs.—Indian Valley, ne. Lake Co., *Jepson* 8989; Hough Sprs., *Jepson* 9014; Mt. Tamalpais, *T. Brandegee*; Vaca Mts., *Jepson*; Red Mt., n. Mendocino Co., *Eastwood*; Kneeland

Prairie, *Tracy* 3844; Union Creek, Trinity Co., *Hall* 8611; Yreka, *Butler* 1358; Rosewood, w. Tehama Co., *Jepson*; Butte Co., *R. M. Austin* 736; Mariposa, *Congdon*; Middle Tule River, *Purpus* 5595.

Refs.—ALLIUM AMPLECTENS Torr. Pac. R. Rep. 4:148 (1857), type loc. Sonoma, *Bigelow*. *A. attenuifolium* Kell. Proc. Cal. Acad. 2:110, fig. 33 (1863), type loc. Mt. Shasta, *Veatch*; Jepson, Fl. W. Mid. Cal. 120 (1901). *A. monospermum* Jepson; Greene, Man. Bay Reg. 321 (1894), type loc. Vaca Mts., *Jepson*. *A. attenuifolium* var. *monospermum* Jepson, l.c.

17. **A. serratum** Wats. Scape 8 to 15 inches high; bulb-coats horizontally serrate-reticulate, the reticulation close but distinct; bracts narrowly acuminate; perianth-segments pink, broadly ovate-lanceolate, 4 to 6 lines long, acute or somewhat acuminate, nearly straight and rather rigid, the inner narrower, somewhat shorter and rarely serrulate; filaments all with a narrowly deltoid base; ovary crests very minute, narrow, central, 2-lobed.

Lower hills of the inner Coast Range from Solano Co. to the Mt. Hamilton Range, thence west to the inner slopes of the Santa Cruz Mts., 300 to 2000 feet.

As here restricted a satisfactory and somewhat localized unit. This species has hitherto been made to do duty over too wide a range. Its umbels have more numerous flowers and its perianth is thinner than in A. peninsulare. After anthesis the tips of the perianth-segments are bent in abruptly and connivent at the center, the whole perianth becoming bladdery inflated.

Locs.—Walker Cañon, Vaca Mts., *Jepson*; Araquipa Hills, Solano Co., *Jepson* 522; Martinez, *Brewer* 994; Lautwasser Creek, *Hall*; Pleasant Valley, Contra Costa Co., *Chandler* 573; Walnut Creek, *Brewer* 1022; Mt. Diablo, *Jepson* 7581; Livermore, *Jepson*; Los Buellis Hills, Santa Clara Co., *R. J. Smith*; Oak Ridge, Mt. Hamilton Range, *R. J. Smith*; Loma Prieta, *Davy* 646.

Refs.—ALLIUM SERRATUM Wats. Bot. King, 487, pl. 37, figs. 4, 5 (1871), type from Cal., *Douglas*; Jepson, Fl. W. Mid. Cal. 120 (1901).

18. **A. dichlamydeum** Greene. Lower than A. peninsulare but very similar; umbels very compact, the pedicels ¼ to ¾ inch long; perianth-segments spreading almost equally, the outer narrowly to broadly elliptic, rounded or as if truncate but shortly acute, the inner for the most part nearly as broad.

Maritime, in a coastal belt from San Mateo Co. to Mendocino Co., extending inland only to the coast-like "island" of vegetation in ne. Contra Costa Co. Bracts 2, commonly united below into a cup; in A. peninsulare they are less united or distinct.

Locs.—Crystal Springs Lake, *C. F. Baker* 809; Mission Hills, *Michener & Bioletti*; Lands End, *H. A. Walker* 179; Antioch, *K. Brandegee*; Bodega Bay, *Chandler* 718; Little River, *Congdon*; Ft. Bragg, *W. C. Mathews* 5.

Refs.—ALLIUM DICHLAMYDEUM Greene, Pitt. 1:166 (1888), type loc. San Francisco. *A. serratum* var. *dichlamydeum* Jones, Contrib. 10:84 (1902).

19. **A. peninsulare** Lemmon. (Fig. 47e.) Habit and bulb-coats of A. serratum, the scapes usually more stocky; pedicels ¾ to 1¼ inches long; perianth-segments deep red-purple, 5 to 7 lines long, the outer 3 broadly ovate-lanceolate, somewhat spreading, twice the breadth and usually ¼ longer than the 3 inner erect attenuate segments which form a sort of inner cup; filaments ½ to ⅔ the length of the segments, those opposite the inner segments with deltoid bases longer than the bases of those alternate; ovary crests central, very minute, narrowly 2-lobed.

Barren or openly wooded hills: cismontane Southern California; Sierra Nevada from Kern Co. to Placer Co.; inner South Coast Range. Also in northern Lower California.

Locs.—Southern California: Santa Catalina Isl., *T. Brandegee*; Sweetwater Dam, *Hall* 3893; Witch Creek, *R. D. Alderson*; Carrizo Creek, *T. Brandegee*; Linda Vista, *T. Brandegee*; Ramona, *T. Brandegee*; Palómar, *Hall* 483; Reche Cañon, San Bernardino Co., *Hall* 1098; Chatsworth Hills, *Hall* 3234; Fish Cañon, San Gabriel Mts., *Peirson* 509. Inner South Coast Range: San Carlos Creek, *Jepson* 2734; Mt. Diablo, *Greene* (perianth-segments denticulate at apex). Sierra Nevada: Kern Cañon, *Heller* 7781; Green Gulch, Mariposa Co., *Congdon*; Hetch Hetchy, *Chesnut & Drew*; Vallecito, *A. L. Grant*; Gwin Mine, Calaveras Co., *Jepson* 1786; Harmon Peak, *Davy* 1430; Newcastle, Placer Co., *Sonne*.

Var. **crispum** Jepson n. comb. Margins of the inner perianth-segments strongly undulate-crisped, as if irregularly serrate; filaments broader, nearly sepaloid; ovary crests almost or quite none.—Inner South Coast Ranges from the Mt. Hamilton Range and San Juan River Valley south to San Luis Obispo Co. and the foothills bordering the upper San Joaquin Valley. The crinkly white edges of the inner segments are very striking in living flowers.

Locs.—Mt. Oso, *Brewer* 1246; Playter Valley, *Hall* 9904; Estrella, *L. Jared*; Paso Robles, *Cobb*; Waltham Creek, *Jepson* 2662; Oil City, Kern Co., *Heller* 7740.

Refs.—ALLIUM PENINSULARE Lemmon; Greene, Pitt. 1:165 (1888), type loc. Los Cruces Cañon, near San Rafael Valley, n. Lower California, *Lemmon*. Var. CRISPUM Jepson. *A. crispum* Greene, Pitt. 1:166 (1888), type loc. Paso Robles, *Parry*.

20. **A. bolanderi** Wats. (Fig. 47f.) Scape very slender, (3 or) 6 to 10 inches high; outer corm-coats dense, the reticulation undulate-serrate; bracts 2, 7 to 8 lines long, ovate-lanceolate, acuminate; pedicels 10 to 17, slender, 5 to 10 lines long; flowers rose-color or pinkish, the ovate very narrowly acuminate segments nearly straight, 4 to 5 lines long, twice longer than the stamens and style, inner segments glandular-denticulate; filaments filiform, adnate to the middle, those opposite the inner segments slightly longer; ovary crested by the rounded summits of the lobes.

Usually in dry soil, brushy hills and open woods, from Lake Co. to Siskiyou and Modoc cos., 800 to 2700 feet. Southern Oregon.

Locs.—Scotts Valley, Lake Co., *Tracy* 1667; S. Fork, junction Trinity River, *Jepson* 2024; Rosewood, w. Tehama Co., *Jepson*; Oak Run, Shasta Co., *Baker & Nutting*; Quartz Valley, Siskiyou Co., *Butler* 1469; Deep Creek, Warner Mts., *L. S. Smith*. Specimens collected by K. Brandegee between Antioch and Marsh Creek have corms and outer coat like A. bolanderi and the habit and flowers of A. serratum.

Var. **stenanthum** Jepson n. comb. Taller with paler (white to pink) flowers and narrower segments.—Eastern and northeastern Humboldt Co.: Klamath River, *Chandler* 1434; Three Creeks to Willow Creek, *Jepson* 1978.

Refs.—ALLIUM BOLANDERI Wats. Proc. Am. Acad. 14:229 (1879), type loc. Eureka Trail, *Bolander* 6556; Jepson, Fl. W. Mid. Cal. 119 (1901). Var. STENANTHUM Jepson. *A. stenanthum* Drew, Bull. Torr. Bot. Club 16:152 (1889), type loc. e. slope Pilot Ridge, Humboldt Co., *Drew*.

21. **A. acuminatum** Hook. (Fig. 47g.) Scape 4 to 8 inches high; outer bulb-coats with a distinct coarse quadrate to hexagonal reticulation; pedicels (numbering 12 to 30) 6 to 12 lines long; flowers deep rose-color, 4 to 7 lines long; segments broadly lanceolate with acuminate recurved tips, a third longer than the stamens, undulate-serrulate above the base; filaments with lower third adnate and dilated; ovary with 6 blunt central crests.

Dry interior hills, Humboldt, Siskiyou and Modoc cos. North to British Columbia and east to Colorado.

Locs.—Hupa, *Chandler* 1349; Yreka, *Butler* 788; Buck Creek, Warner Mts., *L. S. Smith* 938.

Refs.—ALLIUM ACUMINATUM Hook. Fl. Bor. Am. 2:184, t. 196 (1839), type loc. Nootka Sound, British Columbia, *Menzies*; Wats. Bot. King 352, pl. 37, fig. 6 (1871).

22. **A. lacunosum** Wats. (Fig. 47h.) Scape 3 to 6 inches high; bulb-coats light colored, thick and distinctly pitted by the quadrate or transversely oblong reticulation; umbels 10 to 20-flowered, the pedicels 3 to 5 lines long; bracts broadly ovate, tipped with a slender-subulate point; flowers small (3 lines long); perianth-segments pinkish to rose-color with darker or red midnerve, oblong-lanceolate and acuminate, or oblong and acute, a little exceeding the stamens; filaments narrowly deltoid below; each ovary-cell with an obtuse thickened ridge toward the summit on each side, the ridges uniting to form a broad often slightly lobed crest.

Arid areas, mostly toward the interior, central and Southern California, at widely scattered stations.

Locs.—Mariposa Peak; Kernville, *T. Brandegee*; Argus Mts., Inyo Co., *Purpus* 5430; Palm Cañon, Mt. San Jacinto, *Jepson* 1392; Arraster Cañon, San Gabriel Mts., *Peirson* 426; Santa Rosa Isl., *T. Brandegee*.

Refs.—ALLIUM LACUNOSUM Wats. Proc. Am. Acad. 14:231 (1879), type loc. Mariposa Peak, Mt. Hamilton Range, *Brewer* 1284; Jepson, Fl. W. Mid. Cal. 120 (1901).

23. **A. platycaule** Wats. Scape 2 to 5 (or 6) inches high, 2 to 4 lines broad; bulb ½ to 1 inch broad; leaves ½ to 1 inch broad; flowers numerous, rose-color with tips pale greenish tinged, 4 to 7 lines long, on pedicels approximately 1 inch long; segments lanceolate, very narrowly long-acuminate; stamens conspicuously exserted; ovary lobes rounded, not crested.

High valleys, Sierra Nevada from Placer Co. to Modoc Co.

Locs.—Truckee River, Placer Co., *Sonne;* Webber Peak, *G. E. Poore;* Red Clover Creek, Plumas Co., *Hall & Babcock* 4458; Susanville, *T. Brandegee*; Bowman ranch, Warner Mts., *E. H. Steffen*; Deep Creek near Cedarville, *L. S. Smith* 1123; Lake City, *Manning.*

Refs.—ALLIUM PLATYCAULE Wats. Proc. Am. Acad. 14:234 (1879), based on spms. from n. Sierra Nevada (Placer Co. to Plumas Co.). *A. anceps* Baker, Bot. Mag. t. 6227 (1876), not Kell.

24. **A. anceps** Kell. Scape 5 to 6 inches high, 1 to 1½ lines broad; bulb-coats faintly and transversely rectangular-reticulated; leaves somewhat falcate, 1½ to 2½ lines broad; flowers numerous, pale rose-color without dark midveins, 3 to 4 lines long, on pedicels 6 to 8 lines long; segments oblong or linear-lanceolate, acuminate, only slightly or not at all exceeding the stamens; ovary cells with a thin curving ridge at summit which is truncatish or notched above.

East of the Sierra Nevada crest from Sierra Co. north to Oregon and east to western Nevada.

Locs.—Sierra Co., acc. Watson; Madelne Plains, Lassen Co., *C. C. Bruce.* Carson City (*Anderson*) and Reno (*Cowgill*), Nev. Also Bear Valley, San Bernardino Mts., acc. *Parish* (Pl. World, 20:208).

Var. **lemmonii** Jepson n. comb. Perianth-segments shortly lanceolate-acuminate, 2½ to 3 lines long; ovary cells with 2 low narrow parallel or somewhat sinuous ridges; stigma undivided. —Northern Sierra Nevada: Prosser, Nevada Co., *Sonne.*

Refs.—ALLIUM ANCEPS Kell. Proc. Cal. Acad. 2:109, fig. 32 (1863), type loc. Washoe, Nev., *Veatch.;* Wats. Bot. King, 352, pl. 36, figs. 4–6 (1871). Var. LEMMONII Jepson. *A. lemmonii* Wats. Proc. Am. Acad. 14:234 (1879), type loc. Sierra Co., *Lemmon.*

25. **A. modocense** Jepson n. sp. Scape flattened, 1½ to 2 (or 4) inches high, prominently nerved, the 1 or 2 leaves twice as high; reticulation of the bulb-coat none or faintly and transversely quadratish; umbel 20 to 30-flowered, the pedicels 6 to 8 lines long; bracts 2; perianth segments white with broad pink midveins, oblong-lanceolate, 5 to 7 lines long; filaments ⅔ as long as the segments, adnate by the lower ¼ and united by the dilated bases into a low but distinct cup; ovary cells with 2 low thin ridges confluent above and thus forming a single curved obtuse crest.—(Scapus planus, unc. 1½–2 vel 4 altus. folia 1–2. duplo alta; filamenta basi dilatata adnata breviter cupuliformia; lobi ovarii cristis singulis obtusis curvatis.)

Gravelly soil, 5000 to 7000 feet: Modoc Co.

Locs.—Jess Valley, *E. H. Steffen* 803 (type); Goose Lake Valley, *R. M. Austin.*

A. NEVADENSE Wats. Bot. King, 351, pl. 38, figs. 1–3 (1871), type loc. Trinity Mts. to the East Humboldt Mts., Nev., is (ex. char.) very similar to A. modocense but the scapes are terete and the reticulation of the bulb-coats rather minute and very much distorted. We have seen no specimens from California, although it may be expected along the eastern boundary north of Nevada Co.

26. **A. falcifolium** H. & A. (Fig. 47i.) Scape 2 to 3 or 4 inches high, conspicuously flattened (1 to 3 lines broad) and 2-winged, at least above; bulb-coats not reticulated; leaves 3 to 5 lines broad; bracts 2, nearly or quite as long as the flowers; flowers rose-colored, the lanceolate segments acute and erect or attenuate and slightly spreading above, often very minutely glandular-serrate, 4 to 7 lines long; stamens ½ to ¾ the length of the segments; ovary 3-lobed, the lobes creased down the middle and produced above into narrow slightly toothed crests.

Shallow soil on rock rifts or ledges: North Coast Ranges from Napa Co. to Siskiyou Co., 1500 to 6500 feet. North to Oregon.

Locs.—Conn Valley, Napa Co., *Jepson* 6250; Pope Valley, *Saidee Wallace*; Middletown grade, ne. of Mt. St. Helena, *Jepson*; Buck Mt., *Tracy* 4164; Yreka, *Butler* 1167.

Var. **demissum** Jepson n. var. Plants small, 1 to 2 inches high; leaves 2, greatly exceeding the scape; bracts 2; pedicels 3 to 6 lines long; flowers small, 3 lines long, deep red purple.—(Pumila, unc. 1–2 alta; folia 2; flores parvi, lin. 3 longi, atro-purpurei.)—High montane, loose rocky soil, 6000 to 8000 feet, w. Siskiyou Co.: Devil's Backbone, *Jepson* 2069; Marble Mt., *Jepson* 2830 (type).

Refs.—ALLIUM FALCIFOLIUM H. & A. Bot. Beech. 400 (1841), type from Cal., *Douglas*; Wats. Bot. King, 488, pl. 36, figs. 7, 8 (1871); Jepson, Fl. W. Mid. Cal. 119 (1901). Var. DEMISSUM Jepson.

27. **A. breweri** Wats. Very close to A. falcifolium but smaller; scape not 2-winged; leaves two, 2 to 5 lines broad; bracts 2, little exceeding the pedicels; umbel compact, the pedicels 4 to 7 lines long; perianth light rose color, its segments 5 to 6 lines long, mostly erect; stamens ⅔ as long as the segments; ovary crests consisting of a curved ridge, the apex of the crest or curved ridge short and entire or obscurely emarginate.

Mountain summits of the Mt. Diablo, Mt. Hamilton and Santa Cruz ranges, 3500–4500 feet.

Locs.—Mt. Diablo, *Congdon*; Mt. Hamilton, *Pendleton* 889; Santa Cruz Mts., *C. F. Baker* 539.

Refs.—ALLIUM BREWERI Wats. Proc. Am. Acad. 14:233 (1879), type loc. Mt. Diablo, *Brewer* 1060. *A. falcifolium* var. *breweri* Jones, Contrib. 10:83 (1902). The distinctions implied by Watson (Bot. Cal. 2:151) between A. breweri and A. falcifolium do not hold. There is no definite distinction as to stamen length and A. breweri may have glandular-serrulate perianth-segments (*Brewer* 1060) as well as A. falcifolium. Nevertheless we retain the two as species on other grounds.

14. **MUILLA** Wats.

Like Allium, but the herbage without the taste or odor of onions. Scape from a fibro-membranous coated corm and bearing an umbel subtended by 3 acuminate scarious bracts, which are distinct even in the bud, or slightly connate and overlapping at the base; pedicels not jointed at the summit, but subtended by small unequal membranous bractlets. Leaves very narrow, flat to terete. Flowers greenish or yellowish-white. Perianth sub-rotate, persistent, of 6 nearly equal segments; segments slightly united at base, oblong, with a dark 2-nerved mid-rib (alternate segments occasionally 3-nerved). Stamens inserted near the base. Ovules 8 to 10 in each cell; style clavate, persistent and at length splitting. Capsule globose, scarcely lobed, loculicidal. Seeds compressed and angled.—Species 4, California, Nevada and Mexico. (Anagram of Allium.)

Filaments filiform or subulate.
- Perianth without glands ..... 1. *M. maritima.*
- Inner perianth-segments with pit-like glands ..... 2. *M. serotina.*

Filaments greatly dilated, retuse at apex ..... 3. *M. coronata.*

1. **M. maritima** Wats. (Fig. 48a.) Scapes 3 to 9 (or 12) inches high, generally equal to or a little taller than the narrowly linear almost terete leaves; umbel 4 to 12-flowered; pedicels unequal, ¼ to 1 inch long; perianth-segments 2 to 3 lines long, acute to obtuse, the inner generally wider, with broad thickened brownish midnerve and thin greenish-white margins; filaments filiform to subulate; anthers yellow or lurid purple.

Alkaline fields, Sacramento Valley and Marin Co. to Southern California.

Locs.—Vacaville, *Jepson* 1196, 8218; Stege, *Davy* 6527; Mission Hills, San Francisco, *Bioletti*; Crystal Springs Lake, San Mateo Co., *C. F. Baker* 423; Alviso, *Bioletti*; San Martin, *Chandler* 921; Hemet Valley, *Hall* 1138; Escondido, *Alice King*; La Mesa, *Jepson* 6677.

Refs.—MUILLA MARITIMA Wats. Proc. Am. Acad. 14:235 (1879); Jepson, Fl. W. Mid. Cal. 118 (1901). *Hesperoscordium(?) maritimum* Torr. Pac. R. Rep. 4:148 (1857), type loc. Pt. Reyes, *Bigelow*. *Bloomeria maritima* McBr. Contrib. Gray Herb. 56:8 (1918).

MUILLA TRANSMONTANA Greene, Pitt. 1:73 (1887), type loc. Reno, Nev. *Bloomeria transmontana* McBr. Contrib. Gray Herb. 66:8 (1918). Scape fusiform-enlarged at the ground; perianth white.

2. **M. serotina** Greene. Scape taller (14 to 20 inches high); leaves fewer; umbel 10 to 20 (or 40)-flowered; perianth dull white, with very broad green veins to the segments.

Half-open foothills; upper San Joaquin Valley; more common in the mountains or towards the interior of Southern California.

Locs.—Alcalde, *T. Brandegee;* Pasadena, *G. B. Grant* 803; San Jacinto River, *Hall* 519; San Diego, *T. Brandegee;* Blair Valley, e. San Diego Co., *Jepson* 8701.

Refs.—MUILLA SEROTINA Greene, Pitt. 1:152 (1893), type loc. Los Angeles, *Davidson* 2052. *M. tenuis* Congdon, Zoe 5:35 (1901), type loc. Raymond, Madera Co., *Congdon*, may be a synonym.

3. **M. coronata** Greene. (Fig. 48b.) Scape 1½ to 2 inches high; perianth-segments with narrow white scarious border; filaments hyaline, broadly oblong, retuse at summit, the anther on a short inflexed slender cusp arising from the notch.

Antelope Valley, western Mohave Desert.

Ref.—MUILLA CORONATA Greene, Pitt. 1:165 (1888), type loc. Lancaster, Mojave Desert, *Parry*. Well marked by its peculiar filaments.

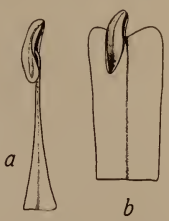

Fig. 48. *a*, MUILLA MARITIMA Wats., stamen, × 16; *b*, M. CORONATA Greene, stamen, × 16.

15. **BLOOMERIA** Kell.

Stem scapose, from a fibrous-coated corm. Leaves linear, carinate. Umbel with many yellow flowers; pedicels jointed at the summit and subtended by membranous bracts. Perianth persistent, of 6 nearly equal distinct segments. Stamens 6, inserted on the base of and rather shorter than the segments; filaments filiform, margined at base by wing-like appendages. Capsule sub-globose; seeds 2 to several in each cell, angular and wrinkled; style 1, persistent and splitting with the loculicidal capsule.—Species 2. (H. G. Bloomer, a pioneer botanist of San Francisco.)

Stamen appendages papillose; style as long or longer than the ovary.....1. *B. crocea.*
Stamen appendages smooth, fleshy; style shorter than the ovary.....2. *B. clevelandii.*

1. **B. crocea** Cov. GOLDEN BLOOMERIA. Scape 6 to 14 inches high, minutely scabrous; leaves 2, 2 to 3 lines wide, one of them as long as the scape; pedicels 30 to 50, 1½ to 2 inches long; bracts several, subulate-lanceolate; perianth-segments orange-yellow, linear-oblong, sub-rotate, 5 to 6 lines long, striped with 2 closely parallel dark lines; lower ⅔ or ½ of the stamen appendages adnate to the perianth, the upper free portion ending in a nectar-bearing often bicuspidate cup bearing the filament; capsule nearly 3 lines long.

South Coast Ranges, east to the Sierra Nevada of Kern Co. and south to cismontane Southern California. May-June.

Locs.—Pacheco Pass; San Antonio Creek, Monterey Co.; Morro, San Luis Obispo Co., *Barber*; Santa Barbara, *Dunn*; Ojai Valley, *Olive Thacher*; Rubio Cañon, foothills east, *Peirson* 6; Cajon Pass, *Jepson* 6107; Mentone, *Parish*; Vandeventer, *Jepson* 1334; San Diego, *Orcutt*; Santa Rosa and Santa Catalina islands (Zoe, 1:145); Santa Cruz Isl., *Greene.*

Refs.—BLOOMERIA CROCEA Cov. Contrib. U. S. Nat. Herb. 4:203 (1893). *Allium croceum* Torr. Bot. Mex. Bound. 218 (1859,—at least as early as Sept.), type loc. summit of the mountains e. of San Diego, *Parry*. *Bloomeria aurea* Kell. Hesperian, 3:437 (Dec. 1859); Proc. Cal. Acad. 2:11, pl. (1863), type loc. New Idria, *Veatch*. *Nothoscordum aureum* Hook. f. Bot. Mag. t. 5896 (1871). *Bloomeria montana* Greene, Bull. Cal. Acad. 1:281 (1885), type loc. near Tehachapi, *Curran*.

2. **B. clevelandii** Wats. Scape stout, 3 to 12 inches high; leaves several, narrow (1 line wide or less); pedicels 20 to 30, slender, 1 to 1¼ inches long; inner flowers of the umbel maturing slowly; perianth-segments yellow with a green stripe, linear-elliptic, 3 to 4 lines long; stamen appendages oblong, entire, obtuse at the summit, adnate to the perianth-segments, only ⅕ their length; capsule 2 to 2½ lines long.

Mesas near San Diego.

Ref.—Bloomeria clevelandii Wats. Proc. Am. Acad. 20:376 (1885), type loc. mesas, San Diego.

16. **BRODIAEA** Sm.

Stem scapose, arising from a corm, erect and straight, or sometimes elongated and twining. Leaves mostly few and grass-like. Flowers in a loose or capitate umbel. Pedicels jointed beneath the perianth. Perianth-tube various. Stamens 6, or the alternate stamens replaced by dilated sterile filaments or staminodia. Filaments slender or more frequently winged and produced beyond the anther in the form of thin appendages. Ovary on a short stipe or sessile. Capsule loculicidal, beaked by the style which splits with the valves.—Species about 40, western North America and in South America, especially Chile. (James Brodie, Scotch botanist.)

While the species of Brodiaea are somewhat diverse in floral characters, especially as to perianth and stamens, the flower is after all reducible to one sufficiently definite generic plan. In any event if we accept more than one genus there must logically be at least seven. In various particulars, however, the various sections (which are by some authors accepted as genera) overlap in a manner that is genetically significant. While Brodiaea volubilis (genus *Stropholirion* Torr.) is remarkable for its long twining stem, at the same time Brodiaea pulchella (genus *Dipterostemon* Rydb.) is often very tortuous at summit of its long stem, a character which is often perceivable too in B. capitata and B. multiflora (genus *Dichelostemma* Kunth) and, what is most significant from the viewpoint of a single genus, even sometimes in B. coronaria (genus *Hookera* Sm.). The perianth tube is markedly inflated in B. volubilis and B. capitata, but this character is also more or less evident in B. pulchella and there is even a suggestion of it in B. minor and B. synandra and perhaps in B. californica. The staminode character is so very unsteady and even erratic that it has no generic value. The total evidence in favor of the close genetic connection of these species is very convincing.

Variation within the species is also very marked. Brodiaea coronaria, minor, filifolia, laxa, ixioides, hyacinthina, and capitata, are especially variable in habit and size, developing a large number of forms, which seem evidently related to the habitat, but are also incorstant in certain of the structural details of the flowers (such as the staminodes) as well as in color. There is at present sufficient material available of the above types to furnish a sort of basis for perhaps sixty species instead of seven, but these would in our opinion quite lack definiteness, since the habital features are not correlated with structural variations in the flowers and the intergrades are too numerous. The staminodia in B. minor and grandiflora are very variable in size and shape, as are the filaments in B. ixioides. B. laxa often has pale or nearly white flowers, B. minor rose-colored ones; B. ida-maia has been found with buckskin color flowers and apparently B. crocea may occur in a pale blue form. The capsules of some, perhaps all, Brodiaeas have good characters but our fruiting material is too inadequate for complete differential fruit diagnoses.

Bibliog.—Smith, J. E., Characters of a new Liliaceous genus called Brodiaea (Trans. Linn. Soc. 10:1–5,—1811). Greene, E. L., Some genera confused under the name Brodiaea (Bull. Cal. Acad. 2:125–144,—1886). Britten, J., Hookera vs. Brodiaea (Jour. Bot. 24:49–51, —1886). Baker, E. G., The Genus Brodiaea and its Allies (Gard. Chron. ser. 3, 20:213–214, 238–239, 459, 687, figs. 36–41, 44–47, 79–81, 117–120,—1896).

A. Umbels loose; stamens 6; anthers versatile (basifixed in no. 7), ovate or ovate-lanceolate; ovary on a long or short stipe; pedicels nearly equal, rather lax; corms somewhat flattened; leaves ¼ to ½ inch wide (except no. 4).—Subgenus Tritelia.

Filaments filiform.

Flowers commonly blue or purple, sometimes pale or nearly white; ovary on a long slender stipe.

Pedicels 1 to 1½ times the perianth.

Stamens in one row; filaments deltoid; restricted range.....1. *B. bridgesii.*

Stamens in 2 rows; filaments not deltoid; mostly adobe or clay fields and hillsides, common and widely distributed.....2. *B. laxa.*

Pedicels 3 to 6 times the perianth; low wet ground mostly near the coast.....3. *B. peduncularis.*

Flowers yellow; ovary equaling or longer than the stipe.

Filaments long, slender, sub-equal; leaves 1 to 2 lines wide.....4. *B. gracilis.*

Filaments short, about equaling anthers, in 2 rows; leaves ¼ to ½ inch wide.....5. *B. crocea.*

Filaments dilated.

Flowers yellow; filaments forked at apex, the anther borne on a cusp in the middle of the notch.....6. *B. ixioides.*

Flowers white; filaments with broadly triangular and slightly united bases..7. *B. hyacinthina.*

B. Umbels loose or mainly so; stamens 3, alternating with staminodia; anthers basifixed, sagittate; pedicels very unequal, firm; flowers blue to violet-purple or rose-color; corms not flattened; ovary short-stipitate; leaves narrowly linear to terete.—Subgenus HOOKERA.

Scapes almost wholly subterranean, the umbel sessile on the ground; staminodia yellowish..... 8. *B. terrestris.*

Scapes 3 to 20 inches high; staminodia white or purple.

Perianth-segments linear, rotate, nearly twice as long as the tube; throat of tube strongly constricted; staminodia purple.....9. *B. minor.*

Perianth-segments oblong, 1 to 1½ times as long as the tube; throat of tube little or not at all constricted; staminodia white.

Filaments winged on each side with an appendage half as long as the anthers..... 10. *B. stellaris.*

Filaments not winged.

Flowers rose-red; staminodia hugging the approximate anthers.....11. *B. rosea.*

Flowers blue; anthers approximate in center around style.

Staminodia ereet or spreading.

Staminodia oblong-lanceolate, mostly acute; scape stout, 7 to 20 inches high. 12. *B. coronaria.*

Staminodia scale-like, triangular, acuminate; scape slender, 4 to 12 inches high.....13. *B. filifolia.*

Staminodia approximate in center.

Staminodia plane, about half as long as the spreading or recurving perianth-segments.....14. *B. synandra.*

Staminodia involute, nearly as long as the erect perianth-segments..... 15. *B. californica.*

C. Umbels capitate or congested; anthers basifixed, nearly sessile; staminodia always present; perianth-tube more or less inflated and angular, or saccate; ovary sessile or short-stipitate; scapes often tortuous or twining; leaves linear.—Subgenus DICHELOSTEMMA.

Stamens 6; inner filaments with 2 lanceolate appendages extended beyond the anthers; braets elliptie, aeute, very conspicuous, of a deep violet-purple or metallie eolor; capsule sessile. 16. *B. capitata.*

Stamens commonly 3; braets acuminate, not so conspieuous.

Flowers blue-purple; staminodia petaloid; pedieels 1 to 3 lines long; umbel capitate; eapsule sessile.

Staminodia deeply parted with a minute cusp or reduced filament in the notch; umbel more or less produced into a short dense raceme.....17. *B. pulchella.*

Staminodia entire, forming a corona; umbel not produeed-racemose.....18. *B. multiflora.*

Flowers rose-red; pedieels ¾ to 1½ inches long; umbel less capitate; eapsule triangular-ovate, acuminate, on a short stipe.

Staminodia anther-like; perianth 6 to 8 lines long, rose-red or pinkish; flowers ereet or nearly so.....19. *B. volubilis.*

Staminodia broadly deltoid, forming a conspicuous corona; perianth 1 to 1¼ inches long; flowers pendulous.

Perianth-tube scarlet, its segments chrome-green.....20. *B. ida-maia.*

Perianth wholly rose-purple.....21. *B. venusta.*

1. **B. bridgesii** Wats. Stems low (5 to 9 inches high); flowers pale lilac, aging bluish; perianth-tube long and very attenuate at base; filaments in 1 row, deltoid at base; ovary stipe 8½ to 10½ lines long.

Open woods, interior of Humboldt Co. to Shasta Co. and south to Mariposa Co., 500 to 3000 feet. Also in southern Oregon. Very similar to B. laxa.

Loes.—Hupa, *Jepson* 2026; Happy Valley, Shasta Co., *W. W. Jones*; Gold Run, *Sonne*; Angels Camp, *Davy* 1485; Mariposa, *Congdon.*

Refs.—BRODIAEA BRIDGESII Wats. Proc. Am. Acad. 14:237 (1879), type loc. Sierra Nevada foothills, *Bridges* 338. *Tritelia bridgesii* Greene, Bull. Cal. Acad. 2:141 (1886). *Hookera bridgesii* Ktze. Rev. Gen. 2:712 (1891).

2. **B. laxa** Wats. Grass Nut. (Fig. 49a, b.) Scape 1 to 2¼ feet high, rigid and stoutish, from a usually deep-seated edible corm; umbel 8 to 48-flowered; pedicels 1 or mostly 2 to 3½ inches long; perianth violet-purple, rarely white, 1¼ to 1¾ inches long, funnel-form, clavate at base, its segments shorter than the tube; stamens 6, all anther-bearing; filaments inserted in 2 rows high on the perianth-tube, 2 lines long; anthers ovate-lanceolate with a 2-lobed base, 1½ lines long; ovary on a slender stipe ½ to ¾ inch long.

Showy and beautiful species, common in adobe fields or on adobe hillsides: Coast Ranges, Santa Cruz and Santa Clara cos. north to Humboldt and Tehama cos., thence south in the Sierra Nevada foothills (500 to 4600 feet) to Tulare Co. Apr.-June.

Very variable in stature, size of umbels and color of flowers; in rich adobe sometimes gigantesque and with large flowers, in sterile clays sometimes dwarfed and with small umbels and small flowers, sometimes with very pale flowers as in the Kaweah River region, or with white flowers in wet places. At the beginning of anthesis the style and the ovary on its long stipe lie along the lower side of the perianth; after the anthers shed their pollen the style arches and stands in the center of the tube. Sheep are fond of this plant; they run along eagerly cropping it, leaving the grass in which it stands. Called Wally-Basket in Tuolumne Co. Ithuriel's Spear is a parlor name.

Locs.—Coast Ranges: Near Monterey, acc. Mary S. Clemens; Los Gatos, *Heller* 7389; Berkeley Hills, *Helen Bergfried*; Mt. Diablo, *Jepson* 7569, 8332; Inverness, *Jepson* 557; St. Helena, *Jepson* 2428; Araquipa Hills, Solano Co., *Jepson* 523; Knoxville ridge, ne. Napa Co., *Jepson* 9046; College City, Colusa Co., *Alice King*; Mt. Sanhedrin, Lake Co., *Hall*; Fort Seward, Humboldt Co., *Tracy* 4453; Eureka, *Tracy* 3711 (white-flowered); Crane Creek, w. Tehama Co., *Jepson*. Sierra Nevada: Oroville, *Heller* 10708; Avery Sta., Calaveras Co., *A. L. Grant;* Columbia, *Jepson* 6349; Limekiln Creek, Tulare Co., *Jepson* 2802; Nelson, Middle Tule River, *Jepson* 4865.

Var. **candida** Jepson n. comb. Pedicels abruptly bent at summit so that the flowers all face horizontally in one direction; flowers white, sometimes blue.—Sierra Nevada foothills, Fresno Co. to Kern Co.

Refs.—Brodiaea laxa Wats. Proc. Am. Acad. 14:237 (1879); Jepson, Fl. W. Mid. Cal. ed. 2, 101 (1911). *Tritelia laxa* Benth. Trans. Hort. Soc. Lond. ser. 2, 1:413, pl. 15, fig. 2 (1835), type from Cal., *Douglas*; Lindl. Bot. Reg. t. 1685 (1835). *Hookera laxa* Ktze. Rev. Gen. 2:712 (1891). *Tritelia angustiflora* Heller, Bull. S. Cal. Acad. 2:66 (1903), type loc. Tiburon, *Heller* 5728. Var. candida Jepson. *Tritelia candida* Greene, Bull. Cal. Acad. 2:139 (1887), type loc. foothills east of Fresno, *J. R. Scupham*. *Brodiaea candida* Baker, Gard. Chron. 20:239 (1896).

3. **B. peduncularis** Wats. Scape erect, 1¼ to 3 feet high; umbel 3 to 15-flowered, the pedicels slender, 2½ to 4 or even 7 inches long; perianth pale rose-purple or nearly white, 6 to 9 lines long, the segments longer than the tube, widely-spreading; ovary yellow, its stipe 1½ to 3 lines long.

Low wet ground, mostly near the coast; Marin Co. north to Humboldt Co., east to Lake Co. June-July.

Biol. Note.—The underground organs have a peculiarity in vegetative multiplication which is peculiar to this species. The corms develop offsets ending in bulblets, the offsets produced through the bulblet (as it were) in the form of a short point (J. P. Tracy).

Locs.—Tiburon, *H. A. Walker* 1725; Point Reyes, *Davy* 6688; Bodega, *Chandler* 676; Moore's Creek, Howell Mt., *Tracy* 2213; Indian Valley, Lake Co., *Jepson* 8988; Eureka, *Tracy* 1920.

Refs.—Brodiaea peduncularis Wats. Proc. Am. Acad. 14:237 (1879); Jepson, Fl. W. Mid. Cal. ed. 2, 102 (1911). *Tritelia peduncularis* Lindl. Bot. Reg. sub t. 1685 (1835), type from Cal., *Douglas*. *Hookera peduncularis* Ktze. Rev. Gen. 2:712 (1891); Jepson, l.c. ed. 1, 117 (1901).

4. **B. gracilis** Wats. Scape 2 to 10 inches high; leaves narrow (1 to 2 lines wide); bracts short, lanceolate; umbel 13 to 29-flowered; flowers dull or saffron yellow, 5 to 7 lines long, on pedicels 4 to 10 lines long; perianth-segments with a brown streak outside, the narrow tube equaling or shorter than the segments; anthers blue, very small; filaments slender, elongated, sub-equal; ovary ovate, equaling stipe.

Granite sand spots on domes and granite ridges: Sierra Nevada, Mariposa and Tuolumne cos. and Plumas Co., 8000 to 9000 feet.

Locs.—Lake Tenaya, *Hall & Babcock* 3523; Conness Creek, Tuolumne Cañon, *Jepson* 3359, 4482; Tamarack Flat, Mariposa Co., *Jepson* 8350; El Capitan, Yosemite, *Jepson* 4361.

Refs.—BRODIAEA GRACILIS Wats. Proc. Am. Acad. 14:238 (1879), type loc. Spanish Peak, Plumas Co., *R. M. Austin*. *Tritelia gracilis* Greene, Bull. Cal. Acad. 2:141 (1886). *Hookera gracilis* Ktze. Rev. Gen. 2:712 (1891).

5. **B. crocea** Wats. (Fig. 49c.) Scape 4 to 12 inches high; leaves 2 to 6 lines broad; bracts linear, elongated; umbels 4 to 8 or 15-flowered; flowers golden or bright yellow, 7 to 9 lines long, on pedicels 3 to 9 lines long, the segments a little longer than the turbinate tube; filaments nearly equaling anthers, in 2 rows; ovary obovate, shorter than the stipe, its angles with a very narrow band of short hairs or scales.

Western Siskiyou Co. and Del Norte Co., 5000 to 7000 feet.

Locs.—Humbug Mt., Siskiyou Co., *Butler* 786; Shackelford Cañon, Marble Mt., *Chandler* 1695; near Preston Peak, *Jepson* 2877.

Refs.—BRODIAEA CROCEA Wats. Proc. Am. Acad. 14:238 (1879). *Seubertia crocea* Wood, Proc. Acad. Phila. 20:172 (1868), type loc. Yreka, *Wood*. *Tritelia crocea* Greene, Bull. Cal. Acad. 2:141 (1886). *Hookera crocea* Ktze. Rev. Gen. 2:712 (1891).

BRODIAEA MODESTA Hall (Univ. Cal. Pub. Bot. 6:166,—1915, type loc. Castle Lake, Siskiyou Co., *J. J. Condit*). This interesting and curious plant is closely related to B. crocea. It is like B. crocea in habit, and its flowers in size and in detail of parts are like those of that species or essentially so, even to the line of pubescence on the angles of the ovary; it differs from B. crocea in its pale or violet-blue perianth. It (with any other associated Brodiaea species) should be studied in its region and re-collected in a full series of specimens. It seems identical with B. crocea and yet it would be rather unusual for a yellow species to throw a blue flower.

6. **B. ixioides** Wats. GOLDEN BRODIAEA. (Fig. 49d, e.) Scape ½ to 1½ feet high, usually scabrous; leaves 2, 7 to 14 inches long; umbel 16 to 40-flowered; pedicels ¾ or mostly 1 to 4 inches long; flowers 7 to 11 lines long, salmon-yellow, with a conspicuous black-purple vein on the outside running from the apex to the base of each segment; stamens yellow, alternately long and short, the filaments winged, slenderly 2-forked at the summit, the oblong anthers on a cusp in the notch; forks of the filament a little exceeding or somewhat shorter than the anthers.

Higher foothills of the Sierra Nevada from Tuolumne Co. to Kern Co., 1300 to 5000 feet, common and often abundant; also in Monterey and San Benito cos. and Tehama Co.

Locs.—Coast Ranges: Carmel River Valley, *Ferguson* 256; San Juan, San Benito Co., *Alma Ames*; Manzanita Flat, w. Tehama Co., *Jepson*. Sierra Nevada: Butte Co., foothills acc. *Boerker*; Columbia, Tuolumne Co., *Jepson* 6303; Crockers, Big Oak Flat road, *Jepson* 8349; Yosemite, *Jepson* 4282; Kinsley, Mariposa Co., *Charlotte M. Hoak*; Dinkey Grove, Fresno Co., *A. L. Grant* 1196; Dunlap, Fresno Co., *Jepson* 2756; Colony Mill, Marble Fork, Kaweah River, *Jepson* 641; Nelson, Middle Tule River, *Jepson* 4867; Caliente, *Heller* 7623.

Var. **lugens** Jepson. Generally smaller and more slender; filaments broadly winged, merely emarginate or retuse at apex, the alternate ones triangular-acuminate; anthers white or blue; perianth-tube dark brown, approaching black.—Sandy slopes, Sierra Nevada, 6000 to 8000 feet; North Coast Ranges, towards the interior, 2400 feet.

Locs.—Sierra Nevada: Long Lake, Plumas Co., *Hall* 9350; Tallac, *C. J. Fox Jr.*; Calaveras Big Trees, *A. L. Grant*; Little Yosemite, *Jepson* 3151; Seavy Pass, Yosemite Park, *Jepson* 4515; Lake Merced, *Jepson* 4406; Miami Lodge, Mariposa Co., *Jepson* 8399; Bear Creek, Fresno Co., *Hall & Chandler* 420; Hockett Mdws., Tulare Co., *Hall & Babcock* 5601. North Coast Ranges: Howell Mt., *Tracy* 1450; Vaca Mts., *R. H. Platt*.

Refs.—BRODIAEA IXIOIDES Wats. Proc. Am. Acad. 14:238 (1879); Jepson, Fl. W. Mid. Cal. ed. 2, 101 (1911). *Ornithogalum ixioides* Ait. f. Hort. Kew. 2:257 (1811), type from Cal., *Menzies*, undoubtedly collected at Monterey. *Tritelia ixioides* Greene, Bull. Cal. Acad. 2:142 (1886). *Hookera ixioides* Ktze. Rev. Gen. 2:712 (1891). *Calliprora lutea* Lindl. Bot. Reg. t. 1590 (1833); Hook. Bot. Mag. t. 3588. The scapes in the typical form are often more or less scabrous and therefore we cite here: *Calliprora scabra* Greene, Erythea 3:126 (1895), type loc. middle Sierra Nevada; *Brodiaea scabra* Baker, Gard. Chron. ser. 3, 20:459 (1896). *Calliprora scabra* var. *anilina* Greene, l.c., type loc. middle Sierra Nevada. *C. analina* Heller, Muhl. 2:14 (1905); cf. Muhl. 5:91 (1909). Var. LUGENS Jepson, Fl. W. Mid. Cal. ed. 2, 101 (1911).

Tritelia lugens Greene, Bull. Cal. Acad. 2:142 (1886), type loc. Vaca Mts., *Greene*. *Hookera ixioides* var. *lugens* Jepson, l.c. ed. 1, 117 (1901).

7. **B. hyacinthina** Baker. White Brodiaea. (Fig. 49f, g.) Scape 1 to 1¾ feet high; umbel 10 to 40-flowered; pedicels ½ to 2 inches long; perianth open-campanulate, cleft below the middle, white or bluish white with green midveins, 5 to 7 lines long; filaments with broadly triangular and slightly united bases, attenuate above and tipped with an anther ½ line long; ovary short-stipitate, with 3 glandular pits towards the summit.

Common in low moist places: Sierra Nevada, Sacramento and San Joaquin valleys, and Coast Ranges from Monterey Co. to Siskiyou Co. North to Vancouver Island.

Biol. Note.—The bulb of this species is very distinctive; it has many coats which, if peeled off, leave a solid center the size of a pea. There are three forms, (*a*) large wet land form, white-flowered, the bulb large, with offsets, (*b*) var. lilacina Jepson, flowers lilac, otherwise the same as (*a*), (*c*) small dry land form, the bulb without offsets.—Carl Purdy.

Locs.—Sierra Nevada: Fort Bidwell, *Manning* 167; Plumas Co., *E. H. Platt;* Bear Valley, Nevada Co., *Jepson;* Placer Co., *Carpenter;* Tahoe, *Jepson* 7733; Gwin Mine, Calaveras Co., *Jepson* 1794; Chinese Camp, *Jepson* 6331; Kaweah River, *Hopping* 28. Coast Ranges: Eureka, *Tracy* 1160; Shasta Valley, *Butler* 1415; Sisson, *Jepson*; Middle Creek Sta., Shasta Co., *Heller* 7911; Crane Creek, w. Tehama Co., *Jepson*; Sweeney Creek, nw. Solano Co., *Jepson* 8256; Vacaville, *Jepson*; Pajaro hills, *Chandler*; Milpitas Ranch, Monterey Co., *Hall* 9980.

Refs.—Brodiaea hyacinthina Baker, Gard. Chron. ser. 3, 20:459 (1896). *Hesperoscordum hyacinthinum* Lindl. Bot. Reg. sub. t. 1293 (1829), type from the "North-west Coast," *Douglas*. *Tritelia hyacinthina* Greene, Bull. Cal. Acad. 2:142 (1886). *Hookera hyacinthina* Ktze. Rev. Gen. 2:712 (1891). *H. lewisii* Hook. Fl. Bor. Am. 2:185, t. 198 A (1839). *Hesperoscordum lacteum* Lindl. Bot. Reg. t. 1639 (1833), type from Cal., *Douglas*. *Brodiaea lactea* Wats. Proc. Am. Acad. 14:238 (1879). *Brodiaea hyacinthina* var. *lactea* Baker, Gard. Chron. ser. 3. 20:459 (1896); Jepson Fl. W. Mid. Cal. ed. 2, 102 (1911). *Hookera hyacinthina* var. *lactea* Jepson, l.c. ed. 1, 118 (1901). Var. lilacina Jepson. *B. lactea* var. *lilacina* Wats. l.c. 239, based on stout plants with large flowers turning more or less to lilac, from Mendocino and Humboldt cos. *Tritelia lilacina* Greene, Bull. Cal. Acad. 2:143 (1886), type loc. Amador Co., *Curran* (there is no material of this in the University of California Herbarium). *Brodiaea lilacina* Baker, l.c.

8. **B. terrestris** Kell. Scape very short, scarcely rising above the surface of the ground, or altogether subterranean; umbel 2 to 10 (or 20)-flowered, its pedicels slender, 3 to 8 inches long; perianth purple, 8 to 10 lines long, the limb rotate; anthers slightly longer than the filaments and shorter than the staminodia, these yellowish, erect, emarginate and with revolute edges.

Often in sandy soil, San Diego Co. to Humboldt Co., and near the coast, especially northward.

Locs.—Julian, *T. Brandegee*; Paso Robles, *Barber*; Jolon, *Brewer* 560; Del Monte, *Heller* 6773; Crystal Springs Lake, *C. F. Baker* 462; Napa Junction, *Sonne*; Del Mar, Sonoma Co., *Kennedy*; mouth of Big River, *Davy* 6580; Ft. Bragg, *W. C. Mathews* 182; Usal, *Jepson* 2209; Eureka, *Tracy* 1159.

Refs.—Brodiaea terrestris Kell. Proc. Cal. Acad. 2:6 (1863), type loc. S. S. Bay region. *Hookera terrestris* Greene, Man. Bay Reg. 318 (1894).

9. **B. minor** Wats. Scape 4 to 10 inches high; umbels 4 to 10-flowered, the pedicels ¾ to 1 inch long, tending to spread horizontally after anthesis; perianth-segments narrow (1 to 1½ lines broad), nearly twice as long as the tube, the throat constricted or very narrow above the ovary; staminodia purple, exceeding or equaling the stamens, 3-toothed at apex; anthers shortly cleft at apex.

Northern Sierra Nevada from Butte Co. to Eldorado Co.

Locs.—Prattville, Plumas Co., *A. L. Coombs*; Sutton House, Butte Co., *R. M. Austin*; Bear Valley, Nevada Co., *Jepson*; Colma, Eldorado Co., *K. Brandegee*; Pleasant Valley near Placerville, acc. Purdy.

Refs.—Brodiaea minor Wats. Proc. Am. Acad. 14:236 (1879). *B. grandiflora* var. *minor* Benth. Pl. Hartw. 340 (1857), type loc. n. Sierra Nevada foothills, *Hartweg* 302. Watson had before him Hartweg's 302 and this we take as the type. It is not the B. minor of California botanists but is *Brodiaea purdyi* Eastw. Proc. Cal. Acad. ser. 2, 6:427, pl. 58 (1896), type loc. Colfax, *Purdy*. *Hookera purdyi* Heller, Muhl. 6:83 (1910).

Fig. 49. *a*, Brodiaea laxa Wats., inflorescence, × 1; *b*, longitudinal section through perianth, × 1. *c*, B. crocea Wats.; opened flower, × 2½. *d*, B. ixioides Wats., flower, × 1; *e*, opened flower, × 2. *f*, B. hyacinthina Baker, inflorescence, × 1; *g*, opened flower, × 2.

Fig. 50. *a*, BRODIAEA ROSEA Baker, inside of flower; × 2; *b*, stamen (side view), × 2; *c*, stamen (dorsal view), × 2; *d*, pistil, × 2. *e*, B. CORONARIA Jepson, flower, × 1; *f*, longitudinal section through perianth, × 1; *g*, pistil, × 1. *h*, B. SYNANDRA Jepson, longitudinal section through perianth, × 1. *i*, B. CAPITATA Benth., inflorescence, × 1; *j*, longitudinal section through perianth, × 2. *k*, B. PULCHELLA Greene, longitudinal section through perianth, × 2; *l*, anther, × 2. *m*, B. VOLUBILIS Baker, inflorescence, × 1; *n*, flower-bud, × 2; *o*, longitudinal section through pistil, × 2.

10. **B. stellaris** Wats. Scape very short (2 to 6 inches high) and pedicels long (1½ to 4 inches); corm flat, without offsets; umbel 3 to 6-flowered; perianth 6 to 9 lines long, the greenish narrow tube nearly equaling the deep-purple rather narrow segments; anthers subsessile, the short filaments bearing two appendages or linear-oblong wings standing directly behind and ½ to ⅔ as long as the anthers; anthers 1½ lines long, shorter than the staminodia; staminodia large, conspicuously white, retuse, apparently erect and not approximate around the style.

Mendocino Range; occurs longitudinally for about 20 miles (Carl Purdy).

Refs.—Brodiaea stellaris Wats. Proc. Am. Acad. 17:381 (1882), type loc. Gould's Ranch in the mountains sw. of Ukiah, *Purdy*. *Hookeria stellaris* Greene, Bull. Cal. Acad. 2:137 (1886). A distinctive species with strong technical characters re-collected only near Orr's Sprs., *Bergfried*.

11. **B. rosea** Baker. (Fig. 50a-d.) Scape slender, 3 to 5 inches high; bulb depressed ovate with heavily fibrous coat, 6 to 12 lines broad; umbel 3 to 10-flowered, its pedicels ½ to 1 inch long; perianth 10 lines long, flesh pink (becoming rose-pink in age or in drying), the midveins darker; perianth-segments oblong-ovate, acute; filaments narrow but backed by a deltoid-dilated wing; anthers hugging the style, deeply and narrowly notched both at base and apex; staminodia long-oblong, notched at the acutish apex, exceeding the anthers and closely approximate about them by their strongly involute margins.

Northeastern Lake Co., on the serpentine rocks.

Locs.—Indian Valley, ne. Lake Co., *Jepson* 8985; Epperson Mt., acc. Purdy.

Refs.—Brodiaea rosea Baker, Gard. Chron. ser. 3, 20:214, fig. 39 (1896). *Hookera rosea* Greene, Bull. Cal. Acad. 2:137 (1886), type loc., Hough's Springs, Lake Co., *Curran*.

12. **B. coronaria** Jepson. Harvest Brodiaea. (Fig. 50e-g.) Scape stout, (5 or) 7 to 20 inches high; umbel 3 to 11-flowered, its pedicels 1 to 3½ inches long; perianth violet-purple, 1¼ to 1¾ inches long; segments narrowly oblong, longer than the tube, in age withering and becoming caudate; anthers 4 to 5 lines long, exceeding or at least equaling the oblong-lanceolate mostly acute staminodia; staminodia erect, the anthers approximate in center around style; ovary with strongly developed angles or shoulders.

Common on rolling plains, in the foothills and mountains, Coast Ranges and Sierra Nevada foothills, Sacramento and San Joaquin valleys, south to cismontane Southern California; north to Vancouver Island; flowering in May and early June at the time of the hay harvest when the hills and fields are turning brown. Altitude 200 to 2500 feet, or up to 4500, or even 8000 feet towards the south. Rarely occurs near the coast.

Locs.—Sierra Nevada: Iron Cañon, Butte Co., *R. M. Austin* 27; Grass Valley, *Heller* 8097; Bear Valley, Nevada Co., *Jepson*; Ione, *Braunton* 1009; Clements, *Jepson* 1822; Columbia, *Jepson* 6395; Confidence, *Jepson* 7712; Strawberry, Tuolumne Co., *Elizabeth Perry*; Tenaya Creek, *Jepson* 4386; Hetch Hetchy, *Jepson* 3474, 4623; Coulterville grade, *Jepson*; Huntington Lake, Fresno Co., *A. L. Grant* 1092; Mineral King, *Jepson* 1153. San Joaquin Valley: Collis, *Jepson* 2744. Southern California: San Bernardino Mts., *Parish* 1660. Coast Ranges: Yreka, *Butler* 1421; Redwood Creek, Hupa road, *Jepson* 1960; Bear Valley, w. Colusa Co., *Jepson* 8971; Mendocino Range, *Jepson* 7628; Windsor, *Jepson* 7655; Mt. St. Helena, *Jepson* 7665; Howell Mt. foothills, *Jepson* 2434; Sweeney Creek, nw. Solano Co., *Jepson* 9053; Vacaville, *Jepson* 4237; Napa, *Jepson*; Sonoma Creek Cañon, *M. S. Baker*; Benicia Hills, *Jepson* 8324; Berkeley, *Helen Bergfried*; Mt. Diablo, *Jepson* 7599; Niles, *Jepson*; Madrona, Santa Clara Co., *Jepson*; Mt. Hamilton, *Holden*; Jolon, *K. Brandegee*.

Var. **mundula** Jepson n. var. Fifteen to 18 inches high; pedicels 3 to 6 or 8 lines long.—(Plantae unc. 15-18 altae; umbella compacta; pediculi lin. 3–6 vel 8 longi.)—Soulsbyville, Tuolumne Co., *Jepson* 7683 (type). A trim tall plant with very compact umbels.

Refs.—Brodiaea coronaria Jepson, Madroño, 1:61 (1917). *Hookera coronaria* Salisb. Parad. t. 98 (1806), type loc. Cal., first collected by *Menzies*; Britten, Jour. Bot. 24:51 (1886); Greene, Bull. Cal. Acad. 2:136 (1886); Jepson, Fl. W. Mid. Cal. 116 (1901). *Brodiaea grandiflora* Smith, Trans. Linn. Soc. 10:2 (1811), type from Vancouver Isl., *Menzies*; Lindl.

Bot. Reg. t. 1183 (1828); Wats. Bot. Cal. 2:153 (1880); Jepson, l.c. ed. 2, 100 (1911). Var. MUNDULA Jepson.

13. **B. filifolia** Wats. Scape 4 to 12 inches high, rather slender, especially when several arise from 1 corm; perianth dark blue, segments rotate; anthers sessile, nearly twice as long as the scale-like triangular narrowly acuminate staminodia.

San Bernardino Valley and foothills.

Locs.—San Bernardino, *Parish* 3669; Arrowhead Hot Sprs., *Parish*.

Var. **orcuttii** Jepson n. comb. Perianth violet to rose-purple; anthers generally longer than the filaments; staminodia absent, or very short, triangular and mostly adnate.—San Diego Co.: San Diego, *T. Brandegee*; Santa Isabel, *Parish* 4413.

Refs.—BRODIAEA FILIFOLIA Wats. Proc. Am. Acad. 17:381 (1882), type loc. San Bernardino, *S. B. & W. F. Parish*. *Hookera filifolia* Greene, Bull. Cal. Acad. 2:138 (1886). Var. ORCUTTII Jepson. *Hookera orcuttii* Greene, l.c., type loc. San Diego, *Orcutt*. *Brodiaea orcuttii* Baker, l.c. fig. 40. *Hookera multipedunculata* Abrams, Bull. Torr. Bot. Club 32:537 (1905), type loc. Cuyamaca Lake, *Abrams* 3897.

14. **B. synandra** Jepson n. comb. (Fig. 50h.) Scape slender, 3 to 8 inches high; umbel 2 to 5-flowered; its pedicels 1 to 2½ inches long; perianth blue, 7 to 12 lines long, its tube oblong or even slightly inflated, 4 to 5 lines long, the segments 1 to 2 lines longer, rotately spreading or often strongly recurved, each with a mid-vein, green on back and running down to base of perianth; anthers 2 to 2½ lines long, close around the style; staminodia broadly ligulate or with somewhat involute margins, commonly 3-toothed at apex, usually closely covering the anthers and closing the throat; ovary with weakly developed shoulders.

Dry adobe or clay soil, often on gravelly or alkaline plains and low hills, Sacramento and San Joaquin valleys, Sierra Nevada foothills and Coast Ranges, south to cismontane Southern California and north to Oregon. Altitude 200 to 2500 feet, sometimes occurring up to 3500 or 7000 feet, especially southward. Not reported from Humboldt and Mendocino cos. The anthers have an open or U-shaped notch at apex; in B. coronaria the anthers are merely cleft at apex.

Tax. Note.—This widely distributed species is the B. minor of Cal. authors and of Wats. in part. It is entirely distinct from the original B. minor Wats. (*B. purdyi* Eastw.), which is restricted to the northern Sierra Nevada. The first available name for the former species is Hookera synandra Heller, the diagnosis of which answers well to B. minor of Cal. authors, especially as to the anthers and position of staminodia. We have not, however, seen Heller's type, nor were we able to collect topotypes when visiting the type locality.

Locs.—Oro Fino, Siskiyou Co., *Butler* 891; Modoc Co., *M. S. Baker*; Stevens, Shasta Co., *M. S. Baker* 358; Santa Rosa, *K. Brandegee* (filaments deltoid-dilated); Vacaville, *Jepson* 4238; Milton, *Davy* 1346; Tollhouse, Fresno Co., *Hall & Chandler* 22; San Miguelito Rancho, Jolon, *Jepson* 1645; Little Green Valley, San Bernardino Mts., *G. R. Hall* 23; Strawberry Valley, Mt. San Jacinto, *Hall* 2093; Santa Ana Mts., *Alice King*; San Diego, *Dunn*; Laguna Mts., San Diego Co., *T. Brandegee*.

Var. **insignis** Jepson n. var. Staminodia straw-color or whitish, ovate-lanceolate, 3½ to 4 lines long, longer than the stamens, and as long as the perianth-tube.—(Staminodia ovato-lanceolata, straminea vel albida, lin. 3½-4 longa, stamina superantia, aeque longa ac tubus perianthii.)—Shepherd Cove, Sequoia Park, *Walter Fry* (type).

Refs.—BRODIAEA SYNANDRA Jepson. *Hookera synandra* Heller, Bull. S. Cal. Acad. 2:65 (1903), type loc. Petrified Forest, Sonoma Co., *Heller* 5742. *H. minor* Greene, Man. Bay Reg. 318 (1894); Jepson, Fl. W. Mid. Cal. 115 (1901). *Brodiaea minor* Jepson l.c. ed. 2, 100 (1911); Wats. Bot. Cal. 2:153 (1880), in part. Var. INSIGNIS Jepson.

15. **B. californica** Lindl. Slender, 4 to 12 inches high; umbels 2 to 4-flowered (sometimes as few as 1 or as many as 12-flowered); perianth violet-purple, 1 to 1½ inches long, the tube ⅓ as long; band on back of segments yellowish-green; anthers long, approximate in center on filaments as long, and closely invested by the staminodia; staminodia white, involute, obtuse, shortly cleft, very slightly surpassing the anthers, commonly both very long, nearly as long as the perianth.

Alkaline flats: Sonoma and Napa cos.; Sacramento Valley (no exact station known).

Locs.—In June 1918 Brodiaea californica was found on Poor Man's Flat near Windsor, Sonoma Co. (*Jepson* 7654, 7621), a rolling clay plain thinly covered with Quercus douglasii. The plants grew in moist swales, a few scattered individuals also occurring on the dry flats. The perianth-segments were erect, the staminodia (quite to their tips) wholly and closely investing the anthers. Saving for these somewhat immaterial points the Windsor specimens represent B. californica Lindl., since they agree so well with the original diagnosis and figure. The Windsor plants also undoubtedly represent, and are probably typical of, *Hookera leptandra* Greene which we have not been able thus far to rediscover at Calistoga, the type locality (although possibly it may have been exterminated by cultivation). A few specimens of the plants from Windsor, at once recognized as representing a clearly distinct species, were distributed as Brodiaea leptandra Jepson, before their identity with B. californica was determined.

While B. californica may well have been re-collected in the Sacramento Valley since Hartweg obtained the type specimen in 1845, we have no records to that effect. It would rather seem from the internal evidence that Greene had no specimens of this species before him when writing his diagnosis of Hookera californica in "Genera Confused under Brodiaea" (Bull. Cal. Acad. 2:136,—1889), a suggestion that is strengthened by the fact that he published the species later as new under the name Hookera leptandra.

Refs.—BRODIAEA CALIFORNICA Lindl. Jour. Hort. Soc. Lond. 4:84, fig. (1849), type loc. nw. Butte Co. (probably near the present settlement of Caña), *Hartweg* 326; cf. Hartweg, Jour. Hort. Soc. Lond. 3:221. *Hookera leptandra* Greene, Pitt. 1:74 (1887), type loc. Calistoga, *Parry*.

16. **B. capitata** Benth. BLUE DICKS. (Fig. 50i, j.) Scape erect, ½ to 1¼ (or 2) feet high, ending in a head-like umbel of 4 to 10 flowers, with about 4 dark purple or metallic bracts; flowers blue, 5 to 8 lines long; perianth-segments elliptic-ovate, obtuse, a little longer than the tube; stamens with anthers 6; filaments opposite the inner perianth-segments with a broad membranous wing extended beyond the anthers as two lanceolate appendages; stamens opposite outer perianth-segments with filaments dilated toward the base only, their anthers less than ½ the size of those of the other set; appendages convergent or connivent, forming a corona and more or less concealing the anthers.

Very common on hillsides and plains through the Coast Ranges, Great Valley, Sierra Nevada foothills and Southern California. Not in the higher mountains, and rare in or absent from the deserts. Southern Oregon, Arizona, Lower California.

In height, size of heads and shade of blue, it is variable, but the variations are of slight taxonomic importance. "Next to Eschscholtzia, Brodiaea capitata is the universal flower of the State."—Edw. R. Barnard, Chancellor of Salisbury Cathedral, England. Also called Cluster Lily and Spanish Lily, Wild Hyacinth (San Bernardino), Nigger-toes (Tulare Co.), Indian Lily and Nigger-babies (Alameda Co.), Sugar-lump (Sonoma Co.), Pigtails and Indian Head (Lake Co.), and Coquinito (Tuhunga).

Biol. Note.—In this species there are three different modes of corm reproduction or rejuvenation.—A new corm regularly develops on top of the old corm at the base of the scape, and replaces the old corm which gradually becomes reduced to a thin fibrous layer (this habit probably occurs in other species of the section or genus). From the base of the corm bulblets are produced in considerable numbers on rather short slender offsets. Further, a corm early in the season (Feb.) often produces beneath, vertically or laterally, a fleshy fusiform structure which gives rise to a new and thus more deeply seated corm.

Locs.—Yreka, *Butler*; Kneeland Prairie, *Tracy* 2674; Buck Mt. (base to the summit, 5500 ft.), *Tracy;* Calistoga, *Jepson;* St. Helena, *Jepson;* Vacaville, *Jepson* 5302; Mt. Tamalpais, *Jepson* 7560; Berkeley, *Jepson*; Monterey and Jolon acc. Eastwood; Pine Ridge, Fresno Co., *Hall & Chandler* 99; Lloyd Mdw., Kern River, *Jepson* 4894; Rowen, Tehachapi Range, *Jepson* 6728; Panamint Mts., *Jepson* 6989; Manzana, Antelope Valley, *Davy*; Santa Monica, *Barber;* Arroyo Seco, *Peirson* 7; Mt. San Jacinto, *Jepson* 1299a; Santa Ana, *Alice King;* La Mesa, San Diego Co., *Jepson* 6685.

Refs.—BRODIAEA CAPITATA Benth. Pl. Hartweg. 339 (1857), type loc., woods near Monterey, *Hartweg* 58; Cov. Contrib. U. S. Nat. Herb. 4:203 (1893); Jepson, Fl. W. Mid. Cal. ed. 2, 101 (1911). *Hookera capitata* Ktze. Rev. Gen. 2:712 (1891); Jepson, l.c. ed. 1, 117 (1901). *Dipterostemon capitatus* Rydb. Bull. Torr. Club, 39:111 (1912).

17. **B. pulchella** Greene. OOKOW. (Fig. 50k, l.) Scape 2 to 3½ (or even 5) feet high, often flexuous; umbel appearing capitate but really short-racemose, 6 to 16-flowered, subtended by 3 to 5 ovate subacuminate bracts; flowers lavender-purple or blue-purple, 7 to 8 lines long, in a dense head; perianth-segments

spreading, oblong, shorter or longer than the tube, which is slightly constricted at apex; anthers 3, sessile; staminodia petaloid, deeply cleft, surpassing the anthers, commonly bearing a short wholly sterile filament in the notch.

Open hills in the Coast Ranges, Alameda Co. to Humboldt Co., thence easterly to Shasta Co. Far north to Washington. Common in Humboldt Co., mostly infrequent in Alameda Co. Flowers later than B. capitata.

Biol. Note.—The three anthers are very flat and converge or approximate around the style by their edges. The cleft staminode is revolute so as to form a cylinder or tube, with the cylinder open on the inside in such a way as to receive the dehiscing edges of a pair of anthers. These tubes, into which the pollen is shed, form the only entrances to the nectarial portion of the tube, so that these structures seem like insect adaptations. We have never observed insects visit this species, although they doubtless do.

Locs.—Alderney, Marin Co., *Jepson* 8277; Bolinas Road near Manzanita, *A. L. Grant* 1210; Berkeley Hills, *Jepson*; Mt. Diablo, *Jepson* 7603; Vacaville, *Jepson* 6796; St. Helena, *Jepson*; Hubbard's Sta., Humboldt Co., *Davy* 5430; Van Duzen River Valley, *Tracy* 2773; Fall River Sprs., Shasta Co., *Hall & Babcock* 4192.

Refs.—Brodiaea pulchella Greene, Bull. Cal. Acad. 2:133 (1886). *Hookera pulchella* Salisb. Parad. Lond. under pl. 98 (1806), type from Cal., *Menzies*. *Dichelostemma pulchellum* Heller, Muhl. 1:132 (1906). *Brodiaea congesta* Smith, Trans. Linn. Soc. 10:3, t. 1 (1811), type loc. Vancouver Isl., *Menzies*; Jepson, Fl. W. Mid. Cal. ed. 2, 101 (1911). *Hookera congesta* Jepson l.c. ed. 1, 116 (1901). *Dipterostemon pulchellus* Rydb. Bull. Torr. Club 39:111 (1912).

18. **B. multiflora** Benth. Scape 8 to 24 inches high, somewhat scabrous; umbel capitate, not produced, 8 to 24-flowered; flowers light purple; perianth-tube constricted upwards; staminodia entire, broad, obtuse, involute-cylindric, equaling or exceeding the anthers; stamens 3, rarely 6 in retarded flowers.

Sierra Nevada foothills, 500 to 3500 feet, Mariposa Co. north to Shasta Co., thence southerly in the Coast Ranges to Humboldt Co. Oregon. June.

Biol. Note.—The anthers converge or approximate in the center around the style. The staminodia are involute-tubular and thus make 3 cylindric passages leading down into the corolla tube, but formed in such a way as to leave a slit on the inner side; into this slit the edge of each pair of contiguous anthers project and dehisce.

Locs.—Hazel Green, Mariposa Co., *Jepson*; Crockers, Big Oak Flat road, *Jepson* 8348; Confidence, Tuolumne Co., *Jepson* 7713; Italian Bar, Tuolumne Co., *Jepson* 6387; Avery Sta., Calaveras Co., *A. L. Grant*; Blue Cañon, Placer Co., *Harriet Walker* 1276; Quincy, *Jepson* 4146; Bear Valley, Nevada Co., *Jepson*; Dixey Mts., Lassen Co., *Baker & Nutting;* Redding, *Heller* 7862; Yreka, *Butler* 1361; Chico, *R. M. Austin* 37; Rosewood, w. Tehama Co., *Jepson*; Hupa, *Chandler* 1310.

Refs.—Brodiaea multiflora Benth. Pl. Hartw. 339 (1857), type loc. Sacramento Valley, *Hartweg* 274; Hook. Bot. Mag. t. 5989 (1872); Purdy, Zoe, 1:101 (1890). *Hookera multiflora* Britten, Jour. Bot. 24:51 (1886). *Dichelostemma multiflorum* Heller, Muhl. 2:15 (1905).

19. **B. volubilis** Baker. Snake Lily. Twining Brodiaea. (Fig. 50m-o.) Scape roughish, 2 or 3 feet high and lax, or twining over bushes and attaining a height of 7 or 8 feet; leaves 1 or 1½ to 2¼ feet long, 4 to 6 lines broad, carinate; umbel short and dense, 18 to 30-flowered; pedicels ½ to 1 inch long; perianth rose-red or pinkish, 6 to 8 lines long; tube 3 to 4 lines long and broad, 6-angled, the angles produced into sacs somewhat above the middle; segments rotate, their tips recurved; stamens 3, inserted on the throat opposite the inner segments, their filaments short, with lanceolate appendages nearly or quite as long as the anthers; staminodia 3, opposite the outer segments, ligulate, emarginate.

Mostly open-brush slopes: Sierra Nevada foothills, Butte Co. to Tulare Co., 500 to 2500 feet; inner north Coast Range.

Locs.—Sierra Nevada: Berry Cañon, se. of Chico, *Heller* 5499; Auburn, *Sonne* 12; New York Ravine, Eldorado Co., *K. Brandegee*; Vallecito, Calaveras Co., *A. L. Grant*; Columbia, *Jepson* 6345; Wawona, *Jepson* 8385; Pine Ridge, Fresno Co., *Hall & Chandler* 80; Kaweah River, *Hopping* 25. Inner North Coast Range: Gates Cañon, Yaca Mts., *Jepson* 555; Napa Valley; Zem Zem, ne. Napa Co., *Jepson* 9048; Kelseyville acc. *Eastwood*.

Refs.—Brodiaea volubilis Baker, Jour. Linn. Soc. 11:377 (1871); Curran, Bull. Cal. Acad. 1:149 (1885); Greene, Bull. Cal. Acad. 2:130 (1886). *Macroscapa volubilis* Kell.

Pacific 3:132 (1854), type loc. Calaveras Co., *Wm. A. Davidson*. *Hookera volubilis* Jepson, Fl. W. Mid. Cal. ed. 1, 116 (1901). *Dichelostemma volubilis* Heller, Bull. S. Cal. Acad. 2:65 (1903). *Stropholirion californicum* Torr. Pac. R. Rep. 4:149, pl. 23 (1856), type loc. Knight's Ferry, *Bigelow*. *Brodiaea californica* Jepson, Fl. W. Mid. Cal. ed. 2, 101 (1911) (not Lindl.).

The final test for the acceptance of the specific name volubilis as the first designation of this species rests upon the argument that Macroscapa volubilis Kell. was adequately published, first because the "Pacific" was a legitimate medium of publication, being a weekly magazine of "religion, education and general intelligence," paged in sequence for the whole volume (and not as a newspaper paged afresh for each issue), and secondly that the species was technically characterized in full.

20. **B. ida-maia** Greene. FIRE-CRACKER PLANT. Scape slender, erect, 1 to 3 feet high, bearing an umbel 6 to 12 (or 23)-flowered, its pedicels ¾ to 1½ inches long; flowers pendulous, erect after anthesis; leaves linear; perianth-tube scarlet, persistent, broadly tubular, slightly 6-saccate at the truncate base, slightly constricted above, 1 to 1¼ inches long; segments chrome-green, short, erect or sometimes reflexed or revolute, erect in age, 2 to 3 lines long; stamens 3, inserted on the throat opposite the inner segments, their filaments very short and broad; anthers innate; staminodia 3, white; capsule triangular-ovate, acuminate, its stipe 2 or 3 lines long; seeds angular, black.

Wooded foothills and mountain slopes from Marin Co. to Shasta and Siskiyou cos., 1000 to 4000 feet. July. A showy and curious species.

Biol. Note.—An apparent hybrid between B. ida-maia and B. pulchella was found at Buck Mt., Humboldt Co., acc. J. P. Tracy. B. ida-maia differs from most other Brodiaeas in propagating by slender offsets from the corm, and from all others in its pendulous flowers, scarlet perianth and strongly revolute perianth-segments. Plants with the flowers all yellow have been found in the hills east of Eureka by Carl Purdy.

Locs.—Elk Mt., Lake Co., *Jepson*; Comptche, *H. A. Walker* 335; Cahto, Mendocino Co., *Davy* 6615; South Fork Eel River, Lake Co., *Jepson*; Buck Mt., *Tracy* 4227; Brannan Mt., *Tracy* 3438; Three Creeks to Redwood Creek, *Jepson* 2132; Highland Mine, Siskiyou Co., *Butler* 889; between Anderson and Olinda, acc. *Alma Ames*.

Refs.—BRODIAEA IDA-MAIA Greene, Pitt. 2:250 (1892). *Brevoortia ida-maia* Wood, Proc. Acad. Phila. 20:173 (1868), type loc. Trinity Mts., Shasta Co., *Wood*. *Brevoortia coccinea* Wats. Proc. Am. Acad. 14:239 (1879); Baker, Gard. Chron. 20:687, fig. 118 (1896). *Dichelostemma ida-maia* Greene, Man. Bay Reg. 318 (1894).

21. **B. venusta** Jepson n. comb. Similar to B. ida-maia but the perianth rose-purple, constricted under the segments; staminodia pinkish, longer than the anthers.

Mendocino Range. Little known; in great need of further study.

Loc.—Near Orrs Hot Sprs., *Helen Bergfried*.

Refs.—BRODIAEA VENUSTA Jepson. *Brevoortia venusta* Greene, Pitt. 2:230 (1892), described from a cultivated plant, its geographic origin unknown. Mr. Carl Purdy considers it to be a hybrid between B. ida-maia and B. congesta (cf. Pitt. 2:249). It is to be inferred from his note that it also occurs near Cahto.

Bessera Schult. Scape from a tunicated bulb and bearing a few-flowered umbel. Stamens 6, inserted on the throat of the 6-cleft perianth, the filaments united above the middle into a tube with erect bifid lobes alternate with the anthers. Style 1. Capsule 3-angled. B. BREVIFLORA Jepson n. comb. (*Androstephium breviflorum* Wats. Am. Nat. 7:303,—1873, type loc. s. Utah, *Thompson*). Flowers light purple.—Fort Mohave, Arizona, *Cooper*, and therefore to be expected within our limits.

17. **CALOCHORTUS** Pursh. MARIPOSA LILY

Stem from a membranous-coated corm. Leaves narrow, the basal solitary or rarely 2, the cauline few. Flowers showy, white, yellow, lilac or bluish, borne terminally on the stem or branches or in an umbellate fascicle. Perianth deciduous, the segments distinct and often concave. Sepals lanceolate, greenish or colored. Petals for the most part broadly cuneate-obovate and usually bearing near the base a conspicuous gland, either on the surface or depressed in an

excavation or pocket. Stamens 6, on the base of the segments. Ovary triquetrous; stigmas sessile, recurved, persistent. Capsule elliptical or oblong, membranaceous, 3-angled or winged, commonly septicidally dehiscent. Seeds numerous, in 2 rows in each cell, somewhat flattened.—West American genus of about 35 species, in California occurring in all mountain ranges, but absent from the Colorado Desert, and mainly or wholly absent from lower altitudes in the Mohave Desert and mainly absent from the floor-like plains of the Sacramento and San Joaquin valleys, i.e., occurring only in restricted localities. (Greek kalos, beautiful, and chortos, grass, in allusion to the flowers and grass-like leaves.)

Bibliog.—Douglas, D., An Account of the Species of Calochortus (Trans. Hort. Soc. Lond. 7:275–280,—1830). Davidson, A., Cal. Field Notes: Calochortus (Eryth. 2:1–2, 27–30,—1894). Parish, S. B., Variations of Calochortus venustus (Zoe, 3:352–354,—1892); The S. Cal. Species of Calochortus (Bull. S. Cal. Acad. 1:102–106, 120–125,—1902). Hansen, Geo., Probable Hybridization in Calochortus (Erythea 2:52,—1894); Calochorti in the Sierra Nevada (l.c. 7:13–15,—1899). Purdy, C., Revision of the Genus Calochortus (Proc. Cal. Acad. ser. 3, 2:107–149, pls. 15–19,—1901). Piper, C. V., Notes on Calochortus (Bull. Torr. Bot. Club, 33:537–540,—1906). Masters, M. T., Calochortus pulchellus (Gard. Chron. 34:133–4, figs. 52, 53,—1903).

A. Flowers open-campanulate, these and the capsules erect; sepals ovate-lanceolate; petals 1 to 2 inches long; capsule ovoid-attenuate, or oblong to linear.

1. *Gland surface densely hairy; basal leaves 1 or 2 to 4, linear, channeled, shorter than the stem (except in occasional dwarfs of nos. 3, 8 and 12).*

a. Gland not depressed, without membrane or scales.

Hairs of gland linear, entire.

Capsule ovoid-attenuate or oblong; gland oval, surrounded or surmounted by a dark blotch.

Capsule oblong, obtuse, flowers cream to lilac; gland surrounded by a dark purplish maroon blotch.....1. *C. catalinae.*

Capsule ovoid, attenuate.

Stems sinuous, often straggling over the ground.....2. *C. flexuosus.*

Stems straight or straightish, erect.

Flowers lilac or purplish to white, reddish brown about the gland....3. *C. palmeri.*

Flowers white or bluish-purple tinged, the petals yellow at base, a purple spot above the gland.....4. *C. leichtlinii.*

Capsule ovoid-linear or linear; petals ornately penciled or blotched; gland shape varying, oval, transverse oblong, lunate or doubly lunate.

Flowers yellow, rarely white; gland transverse, lunate, broadly linear or oblong.....5. *C. luteus.*

Flowers creamy white to purple, rarely yellow; petals usually oculated; gland oval, roundish or quadrate.....6. *C. venustus.*

Hairs of the gland with swollen and knobbed or fungoid-stellate tips; gland circular, oval or irregularly fan-shaped; sepals broadly scarious-margined; capsule linear, dense-walled.

Gland oval with definite outline or absent, its hairs with swollen stellate tips..7. *C. splendens.*

Gland spreading with irregular outline, its hairs broadly elavate, knobbed....8. *C. invenustus.*

b. Gland depressed, surrounded by a more or less continuous laciniate membrane; capsule linear, dense-walled.

Gland not circular.

Gland oval, its membrane generally not continuous; petals dingy white to lurid purple, not persistent.....9. *C. nuttallii.*

Gland obeordate, its membrane continuous; petals purple-lilac, persistent until maturity of fruit.....10. *C. macrocarpus.*

Gland circular, its membrane continuous.

Flowers yellow; stems tall.

Anthers reddish brown; petal hairs clavate.....11. *C. clavatus.*

Anthers yellow; petal hairs slender.....12. *C. concolor.*

Flowers vermilion; stem very low.....13. *C. kennedyi.*

2. *Gland surface naked or with a few scattered hairs; gland circular to oblong, depressed in a pocket, bearing a dense border of linear hairs; hairs of the petals arising from a small dark spot, and of a different or darker hue than the main petal color; corm thickly covered with several coats of dark brown fibres; basal leaf one, broadly lanceolate-acuminate; cauline leaves broad, acuminate.*

Flowers orange-color to lemon-yellow; petals fringed or serrate.
Petals broadly fan-shaped, the margins fringed or serrate....14. *C. weedii.*
Petals ovate, generally black-tipped, much shorter than the sepals, the margins long-fringed. 15. *C. obispocnsis.*
Flowers lilac or lilac-purple; petals neither fringed nor serrate....16. *C. plummerae.*

B. Flowers closed-campanulate (or subglobose); flowers and capsules nodding; petals strongly incurved or arched, the gland deeply pocketed and transversely crested or bearded; basal leaf solitary.

Petals yellow, the margins fimbriate; gland pocket hidden by long hairs borne in 2 or 3 more or less regular rows on the upper fold of the pocket....17. *C. pulchellus.*
Petals white to pale pink or rose, the margins entire; gland lunate, pocketed, with 4 transverse imbricate scales....18. *C. albus.*

C. Flowers campanulate, erect or ascending, the capsules usually nodding; gland shallow to moderately pocketed, covered from below by a narrow fringed scale and crested above (except in C. nudus) by short hairs or scales; claw of petal below the scale often more or less glandular; basal leaf solitary, conspicuously long, surpassing the inflorescence.

Petals obovate, mostly acute, hairy all over; gland proper (excluding the more or less glandular claw of petal below the scale) from moderately curved or lunate to horseshoe-shaped, but always concave on its lower margin; anthers lanceolate-acute.
Petals yellow, or brownish, the hairs all yellow....19. *C. monophyllus.*
Petals white to purplish blue, the hairs on lower half usually blue, on upper half white.... 20. *C. caeruleus.*
Petals fan- or wedge-shaped, truncatish or rounded, naked, or hairy only near the gland; gland proper straight or nearly so in no. 21, in nos. 22 to 24 saucer-shaped to bowl-shaped in outline and always convex on the lower margin; anthers linear to oblong (or narrowly eliptic), acute or obtuse.
Petals white; capsules nodding.
Petals naked; anthers linear; Sierra Nevada....21. *C. nudus.*
Petals hairy about the gland; anthers short oblong; Bay region....22. *C. umbellatus.*
Petals lilac.
Petals finely denticulate, hairy on lower third; capsules nodding....23. *C. uniflorus.*
Petals entire, a very few scattered hairs above the gland; capsules usually erect.... 24. *C. greenei.*

1. **C. catalinae** Wats. Stem commonly branched, 1 to 2 feet high; sepals green, shorter than the petals; petals cuneate, longer than wide, rounded at summit, white tinged with lilac, or lilac or light purple, a large ovate purplish maroon spot at base surrounding the gland; gland oblong, covered with dark hairs; anthers obtuse, pinkish, shorter than the filaments; capsule oblong, obtuse, 1 to 2 inches long, 4 to 5 lines wide; seeds very numerous, white, thin, minutely pitted, 2 lines in diameter.

Coast of Southern California, local from Santa Barbara Co. to Los Angeles Co., and common on the Santa Barbara Islands. Very constant in coloration.

Locs.—Santa Inez Mts., acc. Abrams; Santa Paula, *Cobb* 134; Santa Monica Mts., *Hall* 3263; Casitas Pass, *Hall* 3137; Glendora, *Braunton* 268; Avalon, *Trask.*

Refs.—Calochortus catalinae Wats. Proc. Am. Acad. 14:268 (1879), type loc. Santa Catalina Isl., *Schumacher*; Davidson, Erythea, 2:2 (1894). *C. lyonii* Wats. l.c. 21:455 (1886).

2. **C. flexuosus** Wats. Stem slender, remarkably sinuous, weak, commonly straggling over the ground; sepals greenish with a deep purple spot; petals with numerous striae, truncatish at apex, deep purple (rarely white), with variable bands or spots; gland and its hairs like C. palmeri.

Death Valley region. East through southern Nevada to southern Utah.

Locs.—Argus Mts., acc. Jones in litt. Bighorn Cañon, Grapevine Mts., Nev. (near Cal. line), *Coville & Funston* 978.

Refs.—Calochortus flexuosus Wats. Am. Nat. 7:303 (1873), type loc. s. Utah, *Thompson*; Cov., Contrib. U. S. Nat. Herb. 4:204 (1893). *C. comosus* Nelson, Bot. Gaz., 47:425 (1909), type loc. Las Vegas, Nev., *Gooding* 2323.

3. **C. palmeri** Wats. (Fig. 51a.) Stems 4 to 12 inches high, slightly branched, not bulbiferous at base; sepals purplish-striated, oblong, acuminate, the tip recurving; petals broadly cuneate, rounded at apex, sometimes apiculate, purple, purple-striated, reddish-brown about the gland, sparsely white-hairy except on upper part; gland oval to oblong, densely tufted; hairs a little 4-sided, and narrowly winged at the angles; anthers oblong, obtuse.

Local in moist alkaline spots: borders of the Mohave Desert near the bases of the San Gabriel and San Bernardino mountains. May.

Locs.—Twenty-nine Palms, *T. Brandegee*; Rabbit Springs, *Jepson* 5940; Lancaster, *K. Brandegee.*

Var. **paludicolus** Jepson & Ames n. comb. Sepals yellowish inside with conspicuous oblong brown spots; petals rose to pale pink.—Meadows, Bear Valley, San Bernardino Mts., 6500 feet.

Var. **dunnii** Jepson & Ames n. comb. Stems 1 to 2 feet high; sepals with white-scarious margins, sometimes with a black or reddish-brown blotch near the base; petals white with a brown transverse band crowning the gland.—Local in the interior arid mountains of San Diego Co.: Julian, acc. Purdy; Descanso, *T. Brandegee.*

Refs.—CALOCHORTUS PALMERI Wats. Proc. Am. Acad. 14:236 (1879), type coll. by Palmer (no. 527) at the head of the Mohave River, probably at Los Flores Rancho acc. Parish, Bull. S. Cal. Acad. 1:122 (1902). *C. striatus* Parish, l.c. type loc. Rabbit Sprs., Mohave Desert, *Parish.* Var. PALUDICOLUS Jepson & Ames. *C. paludicola* Davidson, Bull. S. Cal. Acad. 9:53 (1910), type loc. Bear Valley, San Bernardino Mts., *Davidson* 2171. Var. DUNNII Jepson & Ames. *C. dunnii* Purdy, Proc. Cal. Acad. ser. 3, 2:147 (1901), type loc. Julian, San Diego Co., *G. W. Dunn.*

4. **C. leichtlinii** Hook. (Fig. 51b-d.) Stem erect, varying from 2 inches to nearly 2 feet high, with an oblong bulblet at the base; basal leaf narrowly linear, exceeding the stem only in dwarf plants; sepals smoky blue outside, inside yellowish, scarious margined, shorter than the petals; petals obovate-cuneate, rounded at the summit, white (or less commonly purplish) with yellow base and a smoky blue or inky spot above the gland; gland small, oval, thickly covered with yellow linear hairs and with some loose hairs immediately around the gland; anthers oblong, obtuse, slightly sagittate or after dehiscence strongly so.

Common in the Sierra Nevada from Shasta Co. south to Tulare Co., 5000 to 7500 feet. June-July. Petals ⅞ to 1¼ inches long.

Tax. Note.—This species is distinguished from the genuine C. nuttallii Torr. of the Great Basin region by the absence of any membrane surrounding the gland, by the uniformly linear hairs on the surface of the gland, which are never laciniate tipped, by the thinner-walled more ovoid capsule, and by the sagittate anthers. After dehiscence the 4 anther valves spread from the base in pairs (one valve from each cell) and the anthers become strongly sagittate.

Locs.—Pine Creek, Lassen Co., *Baker & Nutting*; Mill Creek Cañon, Tehama Co., *Hall & Babcock* 4355; Jameson Creek, Plumas Co., *Hall* 9311; Webber Lake, Sierra Co., *S. B. Doten*; Donner Lake, *Sonne*; Sonora Pass, *A. L. Grant*; Belle Mdw., Tuolumne Co., *Jepson* 6471; Yosemite, *Jepson* 4251; Lake Merced, *Jepson* 3212; Huntington Lake, Fresno Co., *A. L. Grant*; Long Mdw., Tulare Co., *Jepson* 734.

Refs.—CALOCHORTUS LEICHTLINII Hook. Bot. Mag. t. 5862 (1870), type loc. Sierra Nevada, *Roezl;* Purdy, Proc. Cal. Acad. ser. 3, 2:148 (1901). *C. nuttallii* T. & G. Pac. R. Rep. 2:124 (1855), type loc. Noble Pass, Shasta Co., *Snyder* (not C. nuttallii Torr.). Var. *subalpinus* Jones, Contrib. 12:78 (1908), the form of high altitudes (not C. subalpinus Piper, 1906).

5. **C. luteus** Dougl. YELLOW MARIPOSA. (Fig. 51e.) Stem erect, slender, often branching, ½ to 1 or 2 feet high; bulblets enclosed within radical sheath of stem; basal leaves linear, 1 to 3 lines wide; sepals yellowish within; petals fan-shaped, as long as broad, ¾ to 2 inches long, yellow or orange, rarely white, with or usually without a central brown blotch but with horizontal series of vertical pencilings radiating from gland to center of petal; gland transverse, broadly linear or lunate, usually not reaching quite to edges of petal, densely hairy, with ascending matted yellow hairs; hairs below middle of petal few and scattering; capsule linear-oblong, 1¼ to 1¾ inches long.

Foothills and low rolling gravelly or dry land: Coast Ranges from Mendocino Co. south to San Luis Obispo Co.; borders of the Sacramento and San Joaquin

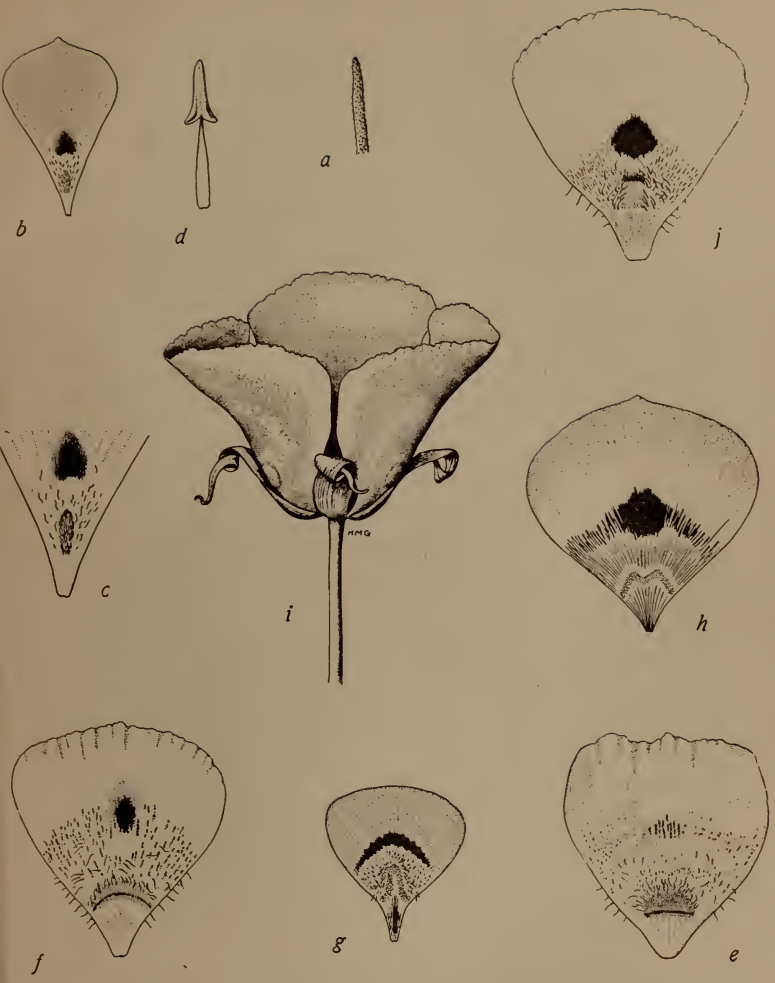

Fig. 51. *a*, CALOCHORTUS PALMERI Wats., hair from gland, × 18. *b*, C. LEICHTLINII Hook.; petal, × 1; *c*, gland, × 2; *d*, stamen, × 2. *e*, C. LUTEUS Dougl., petal, × 1. *f*, var. OCULATUS Wats., petal, × 1; *g*, another petal form, × 1. *h*, var. VESTA Jepson, petal, × 1. *i*, C. VENUSTUS Dougl., flower, × 1; *j*, petal, × 1.

Fig. 52. *a*, CALOCHORTUS SPLENDENS Dougl., gland, × 7; *b*, hair from gland, × 18; *c*, stamen, × 1. *d*, C. INVENUSTUS Greene, petal, × 3; *e*, hair from gland, × 18; *f*, stamen, × 3. *g*, C. NUTTALLII Torr., petal, × 3; *h*, hair from gland, × 18; *i*, stamen, × 3; *j*, stamen after dehiscence of anther, × 3. The glands in this genus generally bear glandular processes, here for convenience called hairs, which are of great importance for specific differentiation. They are described for the first time in this work and are in many cases illustrated by figures.

valleys; and in the Sierra Nevada foothills, mostly below 1800 or 2500 feet. May-June. The most abundant species; extremely variable in color and markings; commonly in the hardest gravel-packed soil.

Locs.—Windsor, Sonoma Co., *Jepson* 7656; Crystal Sprs., San Mateo Co., *Eastwood*; Los Gatos, *Heller* 7387; San Luis Obispo Co., *Rhoda Reed*; Monterey Co., *Purdy*. We have seen no specimens from Southern California. The following are color forms: Var. **citrinus** Wats., whole petal orange-yellow with a central brown spot.—North Coast Ranges to Sierra foothills: Bear Valley, w. Colusa Co., *Jepson* 8969 (dark purple eye-spot, gland crescent-shaped), 9012 (black eye in a spot of orange, gland half moon-shaped); Howell Mt. foothills, *Jepson* 2432; Vacaville, *Jepson* 4245; Sacramento, *Shockley* 397; Jackass Hill, Tuttletown, *Wm. Grant*. Var. **oculatus** Wats. (Fig. 51 f, g): petals white or cream with a central round or transverse brown spot bordered with yellow.—North Coast Ranges (acc. Purdy) to the Sierra foothills: Redding, *Heller* 7845; Columbia, *Helen Gilkey;* Jones Sta., Middle Tuolumne River, *A. L. Grant* 836; Dunlap, Fresno Co., *Jepson* 2755.

Var. **vestae** Jepson n. comb. (Fig. 51h.) Petals pure white above the purple brown eye-spot, heavily penciled between the eye-spot and the gland; gland very narrow, extending in a long arching curve from side to side of the petal and notched or as if interrupted at the summit of the arch (that is "doubly lunate").—Blue adobe soil, interior Sonoma Co. to Humboldt Co.

Locs.—Anderson Valley, acc. *Purdy*; Larribee Creek, *Tracy* 4713; Buck Mt., *Tracy* 4513.

Refs.—Calochortus luteus Dougl.; Lindl. Bot. Reg. t. 1567 (1833), type from Cal., *Douglas;* Wats. Proc. Am. Acad. 14:265 (1879); Bot. Cal. 2:175 (1880); Jepson Fl. W. Mid. Cal. 112 (1901). Var. citrinus Wats. l.c. *C. venustus* Dougl. var. *citrinus* Baker, Jour. Linn. Soc. Bot. 14:310 (1874), type from Cal., *Bridges* 284. Var. oculatus Wats. l.c. Var. vestae Jepson. *C. venustus* var. *vesta* Purdy in Bailey, Cycl. Am. Hort. 1:221 (1902). *C. vesta* Wallace, Gard. Chron. ser. 3, 18:14 (1895); Purdy, Proc. Cal. Acad. ser. 3 (Bot.), 2:139 (1901), type loc. Ukiah Valley, *Purdy*.

6. **C. venustus** Dougl. White Mariposa. (Fig. 51i, j.) Stem erect, stiff, usually branching, 4 to 10 inches or up to 2 or 4 feet high, 1 to 4-flowered; bulblet at base usually 1; petals broadly cuneate-obovate, 1 to 1¾ inches broad, 1 to 2½ inches long, white, varying to pale rose-color or lilac, with a red-brown eye-spot above the gland, frequently penciled toward the base, and often with a transversely oblong rose-colored blotch near the apex; gland roundish, or quadrate, densely matted with short hairs, a few scattered hairs near the gland; capsule linear, 2 to 3½ inches long.

Frequent in light sandy or alkaline soil: Coast Ranges from Mendocino Co. south to Los Angeles Co.; borders of the Sacramento and San Joaquin valleys; Sierra Nevada foothills and [illegible] to 2500 or even 5000 feet. June-July.

Quite constant in the shape of the gland and infinitely variable in its color markings. One finds hillslopes in the Sierras, dotted with hundreds of individuals, but no two flowers exactly alike in the details of the color pattern.

Locs.—Tejon Pass, *Hall* 6265a; Ojai Valley, *Olive Thacher*; San Luis Valley, *Summers* 844; Paso Robles, *Purdy*; Gilroy, *Jepson*; Coyote Creek, Santa Clara Co., *Jepson*; Niles, *Jepson*; Mt. Diablo, *Jepson* 7571; Vacaville, *Jepson*; Round Valley, Mendocino Co., *Westerman;* Morley's Sta., Shasta Co., *Baker & Nutting;* Murphy, *A. L. Grant;* Columbia, *Jepson* 6346, *Helen Gilkey*; Linden, San Joaquin Co., *Gunnison*; Hamilton's, Mariposa Co., *A. L. Grant*; Eight Mile, Wawona Road, *Jepson* 4294; Miami Lodge, Mariposa Co., *Jepson* 8398; Cascada, Fresno Co., *A. L. Grant* (petals bronze color); Greenhorn Range, *Hall & Babcock* 5064.

Refs.—Calochortus venustus Dougl.; Benth. Trans. Hort. Soc. Lond. ser. 2, 1:412, pl. 15, fig. 3 (1835), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal., 111 (1901). Var. purpurascens Wats. Proc. Am. Acad. 14:266 (1879), "petals deep lilac or purplish with similar markings."—Kern Co. Var. sulphureus Purdy, Proc. Cal. Acad. ser. 3, 2:141 (1901), petals light yellow, oculated.—Newhall and Alcalde.

7. **C. splendens** Dougl. Lilac Mariposa. (Fig. 52a-c.) Stem erect, 1 to 2 feet high; sepals with a small purplish black spot at the base; petals fan-shaped, clear lilac with long scattered hairs on the lower third or fourth; gland small, round or oval, situated very low on the base of the petal or sometimes absent; gland surface covered with broad hairs whose expanded fungoid stellate tips form a dense mass; capsule narrowly linear, 1½ to 2 inches long.

Contra Costa and Monterey cos. southward to San Diego Co. Common on half-open or bushy hills or mesas. May. Petals 1⅛ to 1¾ inches long.

Locs.—Mt. Diablo, *Jepson* 8326; Carmel River Valley, *Ferguson* 253; Waltham Creek, San Carlos Range, *Jepson* 2659; Atascadero, *Brewer* 507; Cajon Pass, *Jepson* 6099; e. San Bernardino Valley, *Jepson* 5544; Riverside, *Jepson* 1228; San Timoteo Cañon, *Jepson* 6081; San Jacinto Cañon, *Hall* 2014; Santa Aña Mts., *Alice King*; San Diego, *T. Brandegee*.

Ref.—Calochortus splendens Dougl.; Benth. Trans. Hort. Soc. Lond. ser. 2, 1:411, pl. 15, fig. 1 (1835), type from Cal., *Douglas*.

8. **C. invenustus** Greene. (Fig. 52d-f.) More slender and shorter than C. splendens; stems 8 to 12 inches high, bulblet-bearing at the base; petals smaller, the scattered hairs short; gland irregular, spreading, fan-shaped; gland hairs cylindrical or subclavate with knobbed sides, not expanded stellate.

Moist spots, plateau valleys in the mountains bordering on the west the desert region of Southern California, 4000 to 6500 feet; somewhat rare. May.

Locs.—Vandeventer, *Jepson* 1462; San Jacinto Mts., *Reinhardt*; Rock Creek, *Peirson* 9; Leonis Valley, *Davy* 2608; Tehachapi, *Greene*.

Refs.—Calochortus invenustus Greene, Pitt. 2:71 (1890), type loc. Tehachapi, *Greene*. *C. splendens* var. *montanus* Purdy, Proc. Cal. Acad. ser. 3, 2:143 (1901), type loc. Raynetta, Mt. San Jacinto. *C. invenustus* var. *montanus* Parish, Bull. S. Cal. Acad. 1:124 (1902). *C. montanus* Davidson, Bull. S. Cal. Acad. 9:54 (1910).

9. **C. nuttallii** Torr. Sego Lily. (Fig. 52g-j.) Stem 3 to 17 inches high, bulblet-bearing at base; basal leaf shorter than the stem or sometimes equaling it in dwarf forms; flowers solitary or in umbels; bracts with white-scarious margins; sepals shorter than the petals; petals cuneate-obovate, apiculate, slightly erose, 1 to 1¾ inches long, white, sometimes shaded with lilac or with purple, often a darker purple spot near the gland, a few long linear hairs about the gland; gland oval, rarely circular, bordered by a more or less continuous laciniated membrane and covered with hairs more or less laciniate at the tips; anthers yellow, oblong-linear, obscurely sagittate at base, commonly tortuous after dehiscence, slightly longer than the filaments; capsule linear, 2 to 2½ inches long, attenuate at both ends.

Arid mountains or valleys, 4000 to 10,000 feet; east slope of the Sierra Nevada and south to the high ranges bordering the deserts in Southern California; east to the Rocky Mts.

Locs.—Honey Lake, *T. Brandegee*; Volcano Creek, Tulare Co., *Hall & Babcock* 5426; Mt. Pinos, *Hall* 6506. The Owens Valley plants have purplish maroon anthers (= *C. excavatus* Greene): White Mts., *Jepson* 7247; Bishop, *Almeda Nordyke*. The following from Southern California are more slender but agree technically with the species: Lytle Creek Cañon, Mt. San Antonio, *Hall* 1452; Bear Valley, San Bernardino Mts., *Parish* 3159; Santa Ana Cañon, *Hall* 7655; Mt. San Jacinto, *Jepson* 2321. The following are extra-limital: Verdi, Washoe Co., Nev., *Sonne*; Mangas Sprs., N. M., *O. B. Metcalfe*; Indian Creek, Carbon Co., Wyo., *Goodding*; Malheur River, e. Ore., *Cusick* 2544.

Refs.—Calochortus nuttallii Torr. in Stansbury Expl. Utah, 397 (1852), type loc. Salt Lake Valley, Utah, *Stansbury*; Purdy, Proc. Cal. Acad. ser. 3, 2:146 (1901) in part. *C. leichtlinii* of many authors as to Great Basin or Rocky Mt. plants. *C. excavatus* Greene, Pitt. 2:71 (1890), type loc. Bishop Creek, Inyo Co., *Shockley* 427. *C. discolor* Davidson, Bull. S. Cal. Acad. 14:11 (1915), type loc. Bishop, *Davidson* 2672. *C. campestris* Davidson, Bull. S. Cal. Acad. 14:12 (1915), type loc. Bishop, *Davidson* 2657. Petals pink; gland circular.—Ex. char. *C. acuminatus* Rydb. Bull. Torr. Club 24:189, pl. 301 (1897), type loc. Lima, Montana, seems close to C. nuttallii but has narrower more acuminate petals.

10. **C. macrocarpus** Dougl. (Fig. 53a, b.) Stem bulbiferous at base, stout, erect, 1 to 2 feet high; cauline leaves 3 to 5, narrow and convolute; sepals long-lanceolate, stiffly spreading, purple inside, equaling or slightly exceeding the petals; petals persistent until capsule has reached almost mature size, long obovate, prominently apiculate, 1½ to 2¼ inches long and ¾ inch wide, purple-lilac, lighter at base and sometimes with a deeper band below middle, a greenish median line on the back, the lower third of petal white and with scattered hairs

Fig. 53. *a*, CALOCHORTUS MACROCARPUS Dougl., gland, × 7; *b*, stamen, × 1. *c*, C. CLAVATUS Wats., gland, × 7; *d*, hair from gland, × 18; *e*, stamen, × 1. *f*, C. CONCOLOR Purdy, gland, × 7; *g*, stamen, × 1. *h*, C. KENNEDYI Porter, base of petal, × 7; *i*, gland, × 12; *j*, stamen, × 1.

Fig. 54. Calochortus weedii Wood; *a*, habit, × 1; *b*, petal, × 3; *c*, gland, × 12; *d*, stamen, × 2.

above the gland; gland broadly A-shaped or oval with a notch on the lower side, bordered by a continuous doubly laciniate membrane and densely covered with broad hairs whose divided clavate tips form a compact mass; anthers purple or yellow, ovate-lanceolate, acutish, 4 to 7 lines long; capsule attenuate, 1½ to 2¼ inches long; seeds round, flat, 2¼ lines in diameter.

Dry sandy soil in the interior: Lassen and Modoc cos. North to British Columbia.

Locs.—Susanville, *T. Brandegee;* Eagle Lake, *M. S. Baker;* Mt. Bidwell, *Jepson* 7857.

Ref.—CALOCHORTUS MACROCARPUS Dougl. Trans. Hort. Soc. Lond. 7:276, pl. 8 (1830), type loc. near the Great Falls of the Columbia River, *Douglas.*

11. **C. clavatus** Wats. (Fig. 53c-e.) Stem very stout, stiff, strongly zigzag, branching, 1 to 3 feet high; cauline leaves broad; pedicels stout, 2 to 5 inches long; flowers bowl-shaped; sepals yellowish within, often purplish spotted, greenish without, with dry scarious margins; petals rich yellow, broadly fan-shaped, rather truncate, 1½ to 2 inches long, 1½ to 2¼ inches wide, strongly arched, hairy below the middle or only near the gland, often with a narrow reddish brown or lilac band above the hairy zone, the claw often reddish brown; hairs of the petals scattered, yellow, purplish red at base, the tips narrowly clavate; gland circular, bordered by an annular membrane, its inner edge deeply twice incised; gland surface thickly covered with very broad hairs with much divided or coralline tips; anthers ovate-oblong, obtuse, purplish brown, shorter than the slender filaments; capsule linear, attenuate above and below, 3 inches long.

Dry rocky points, usually in volcanic soils: South Coast Ranges (San Benito Co. to Los Angeles), infrequent; rare in the central Sierra Nevada. May.

Locs.—Coast Ranges (sepals ⅔ the length of the petals and gland in a shallow pocket): San Carlos Creek, *Jepson* 2730; Arroyo Grande, *Alice King;* Ojai Valley, *Olive Thacher;* San Fernando, comm. by *Elizabeth Palmer;* Mint Cañon, San Gabriel Mts., *Peirson* 288. Sierra Nevada (sepals equal to or exceeding the petals, the gland in a deep pocket): Pleasant Valley, Eldorado Co., *Purdy;* White Rock, Mariposa Co., acc. Purdy.

Ref.—CALOCHORTUS CLAVATUS Wats. Proc. Am. Acad. 14:265 (1879), type loc. San Luis Obispo, *Lemmon.*

12. **C. concolor** Purdy. GOLDEN-BOWL MARIPOSA. (Fig. 53f, g.) Stem 2 feet high, one to several-flowered; bulb large, reddish; pedicels stout, 1 to 3 (or 5) inches long; sepals yellowish within, purple banded, purplish-brown on the back; petals deep rich yellow tending toward orange, generally with a purplish band just above the lower third of the petal, broadly fan-shaped, 1½ to 2 inches long and as broad as long, slightly rounded at summit, the lower third or fourth thickly hairy with long erect yellow hairs; gland small, rounded oblong, covered by a deeply laciniate annular membrane, the linear divisions of the membrane converging in the center over the gland like an iris diaphragm; surface of the gland thickly covered with narrowly linear mostly entire hairs; anthers yellow, linear, slightly exceeding the filaments; capsule strongly triquetrous, lance-linear, attenuate above.

Bushy often rocky hills, cismontane Southern California from San Diego Co. north to San Bernardino.

Locs.—Crafton, acc. *Parish;* Chalk Hill, Mt. San Jacinto, *Hall* 2285; El Toro Mt., *Hall;* Santa Isabel Creek, *Stephens;* San Vicente Rancho, Ramona, *K. Brandegee;* Cuyamaca Mts., acc. Purdy.

Refs.—CALOCHORTUS CONCOLOR Purdy, Proc. Cal. Acad. ser. 3, 2:135 (1901), type loc. Laguna, San Diego Co., *D. Cleveland. C. luteus* var. *concolor* Baker, Garden, 48:440, pl. 1043 (1895); the colored plate is a very fine one.

13. **C. kennedyi** Porter. (Fig. 53h-j.) Stem rather stout, 2 to 6 (rarely 8 to 14) inches high, 2 to 4-flowered; flowers in umbels; pedicels 1 to 4 inches long; sepals ½ to ⅔ the length of the petals, vermilion or orange inside, often spotted with brown near the base, brownish without, with white-scarious margins; petals

cuneate, rather truncate, ¾ to 1½ inches long, nearly as broad, flame-color, brilliant vermilion or rarely orange, naked above, a few scattered hairs below, sometimes with a black band or patch on the lower portion; gland very small, circular, bordered by a narrow black annular membrane with the inner ashy-gray edge laciniate, its surface thickly covered with short slender hairs, the hairs orange below, ashy above, once or twice dichotomously cleft; anthers brownish-purple; capsule 1½ to 2 inches long, 4 to 5 lines wide, attenuate above, the sides light-colored but often bordered at the angles with a stripe of purplish-brown.

Hard clay or gravelly soil: Mohave Desert west to Ventura Co., east to southern Nevada and Arizona. Frequent. May.

Locs.—Mt. Pinos, *Hall;* Cuddy Cañon, Kern Co., *Hall*; New York Mts., *Jepson* 5447; Warrens Well, *Jepson;* Ord Mt., *Jepson* 5880; Stoddard's Well, *Jepson* 5906; Victorville, *Hall.*

Refs.—CALOCHORTUS KENNEDYI Porter, Bot. Gaz. 2:79 (1877), type loc. Kern Co., *W. L. Kennedy. C. speciosus* Jones, Contrib. W. Bot. 14:28 (1912).

14. **C. weedii** Wood. WEED'S MARIPOSA. (Fig. 54.) Stem 1 to 2½ feet high, usually much branched, stout and flexuous, leafy, 1 to many-flowered, not bulbiferous; sepals shorter than or often exceeding the petals, narrowly ovate-lanceolate, yellowish within, scarious-margined; petals broadly cuneate, rounded above, sometimes apiculate, orange-color to lemon yellow, nearly covered with long silky hairs each set in a small dark spot, or the upper fourth or fifth naked; upper margins of petals fringed or serrate; gland small, circular, enclosed by a dense ring of hairs and generally bearing a few scattered hairs on its surface; anthers oblong-linear, shorter or longer than the filaments; capsule narrowly oval, attenuate above, 1½ inches long.

Dry hills, San Diego Co.; south to Lower California. June. Common on the coast. Flowers 1 to 1¼ inches long.

Locs.—Palomar, *Jepson & Hall;* Capitan School, *K. Brandegee*; Laguna Mts., *T. Brandegee;* Valley Center, *Chandler* 5440; San Diego, *K. Brandegee;* Del Mar, *Jepson* 1611; Rainbow, *Parish* 4458.

Var. **vestus** Purdy. Petals truncatish, reddish-brown, covered with golden hairs, the upper third with brown hairs, and the margin fringed with brown hairs; anthers oblong-lanceolate.—Santa Barbara and Ventura cos.: Ojai Valley, *Olive Thacher.*

Refs.—CALOCHORTUS WEEDII Wood, Proc. Acad. Phila. 20:169 (1868), type loc. San Diego, *Weed;* Purdy, Proc. Cal. Acad. ser. 3, 2:132, pl. 17 (1901). Var. VESTUS Purdy l.c. 133, type loc. Santa Barbara, *Purdy.*

15. **C. obispoensis** Lemmon. Habit of C. weedii; sepals ⅓ to ¼ longer than the petals; petals ovate, acuminate, the tips generally black and fringed with long black hairs; gland circular to oblong, enclosed by a dense ring of very long orange hairs, the surface naked or bearing a very few scattered hairs; anthers oblong, obtuse, shorter than the filaments; capsule linear, 1 to 1½ inches long.

Cañons of the hills and mountains, San Luis Obispo Co.

Locs.—Santa Lucia Mts., *Summers*; San Luis Obispo, *Rhoda Reed*; Arroyo Grande, *F. Lowe.*

Refs.—CALOCHORTUS OBISPOENSIS Lemmon, Bot. Gaz. 11:180 (1886), type loc. San Luis Obispo, *Lemmon. C. weedii* var. *obispoensis* Purdy, Proc. Cal. Acad. ser. 3, 2:133 (1901).

16. **C. plummerae** Greene. Habit of C. weedii; corms large, often 2, enclosed side by side in a dense fibrous coat; sepals lanceolate (white-scarious margined at base), elongated attenuate, exceeding the petals; petals cuneate, apiculate or rounded above, lilac or lilac-purple with orange-colored hairs on lower half, the hairs usually arising from deep purple spots; gland small, circular, pocketed, enclosed by a dense ring of long orange-colored hairs gathered together above the gland, its surface naked or sometimes bearing one or few solitary hairs; capsule narrowly linear, 1¼ to 3¼ inches long.

Fig. 55. CALOCHORTUS PULCHELLUS Dougl. *a*, flowering branchlet, × 1; *b*, petal (median longitudinal section, showing the inner face), × 7; *c*, petal (outer face), × 3; *d*, stamen, × 2.

Fig. 56. *a*, CALOCHORTUS ALBUS Dougl., flowering branch, × 1; *b*, petal, × 1½. *c*, var. RUBELLUS Greene, hair from gland, × 24. *d*, C. MONOPHYLLUS Jepson, flowering branchlet, × 1; *e*, petal, × 2; *f*, petal, × 5; *g*, stamen, × 4.

Dry slopes and mesas: Santa Monica Mts., through the San Gabriel and San Bernardino mountains to the San Jacinto Mts. Common.

Locs.—Plants of the region from Newhall to San Bernardino have evenly shaded petals and the gland pocket shallow; plants from the San Jacinto Mts. have the petals conspicuously purple spotted and the gland in a deeply folded pocket forming a conspicuous convex ridge on the outside. Newhall, *Barber* 176; Santa Monica Mts., *J. Q. Adams*; Rubio Cañon, foothills east, *Peirson* 8; Cajon Pass, *Hall* 1417; San Bernardino, *Parish;* San Jacinto Mts., *G. F. Rinehardt.*

Refs.—Calochortus plummerae Greene, Pitt. 2:70 (1890), type loc. Mill Creek Cañon, San Bernardino, *Lemmon. C. weedii* var. *purpurascens* Wats. Proc. Am. Acad. 14:265 (1879), based primarily on spms. from Cajon Pass (acc. McB. Contrib. Gray Herb. 56:13).

17. **C. pulchellus** Dougl. Golden Lily Bell. Fairy Lantern. (Fig. 55.) Stem flexuous, usually dichotomously branching, ½ to 1¾ feet high, 2 or 3 to 12-flowered; basal leaf ½ to ¾ inch wide, equal to or taller than the stem, green, glossy, sometimes tinged with purple; bracts linear-lanceolate, equaling or exceeding the flowers; flowers sub-globose, nodding; sepals greenish or brownish-yellow, ovate-lanceolate to elliptic-ovate, abruptly acute, 10 to 15 lines long, slightly shorter than the sub-orbicular petals; petals golden yellow, strongly arched or incurved, their apices overlapping and the margins bluntly incised or fringed; gland in a deeply set pocket (visible from the outside as a convex ridge), its upper fold bearing 2 or 3 rows of appressed glandular yellow hairs crossing each other over the opening of the pocket; hairs of the gland simple or with divided tips; petals with scattered hairs above the gland or rarely almost glabrous; anthers oblong, acute, 2 lines long, usually a little shorter than the filaments; capsule elliptical, abruptly short-beaked, winged, ¾ to 1¼ inches long.

Wooded hills, Mt. Diablo and in the North Coast Ranges from Marin and Solano cos. north to Humboldt and Tehama cos. Apr.-May.

Tax. Note.—In most plants from the North Coast Ranges the petals have very few hairs, usually (but not always) near the gland (= *C. amabilis* Purdy, Proc. Cal. Acad. ser. 3, 2:119,—1901; *C. pulchellus* var. *amabilis* Jepson, Fl. W. Mid. Cal. 113,—1901). In most plants from Mt. Diablo the hairs are scattered generally over the surface of the petal (the form taken by Purdy, l.c., as typical *pulchellus*), but other plants from Mt. Diablo have few hairs and thus match North Coast Range specimens, so that the form C. amabilis is not sufficiently distinct even for a variety. Over and above these considerations it may be pointed out that Bentham's statement, petal above the gland slightly covered with scattered hairs, may be applied to plants of both regions. The margins of the petals in North Coast Range plants, while generally short-fringed, are sometimes long-fringed as in Mt. Diablo specimens.

Locs.—Mt. Diablo, *Jepson* 7570, *Eastwood, Purdy*; Corte Madera, *Heller* 7364; Los Guilicos, *Michener & Bioletti*; Santa Rosa Creek Cañon, *M. S. Baker*; Howell Mt., *Tracy*; Ukiah, *Purdy*; Fort Seward, Humboldt Co., *Tracy*; Laribee Creek, Humboldt Co., *Tracy* 4711; Crane Creek, w. Tehama Co., *Jepson* (petals almost glabrous, a few hairs near the gland); Island Mt., Trinity Co., *Marion R. Parsons.*

Refs.—Calochortus pulchellus Dougl.; Benth. Trans. Hort. Soc. Lond. ser. 2, 1:412, pl. 14, fig. 1 (1835), type from Cal., *Douglas;* Wood, Proc. Acad. Phila. 20:168 (1868); Purdy, Proc. Cal. Acad. ser. 3, 2:118 (1901). *Cyclobothra pulchella* Benth. l.c.; Lindl. Bot. Reg. t. 1662 (1835). *Calochortus amabilis* Purdy l.c. 119; Jepson, Fl. W. Mid. Cal. ed. 2, 98 (1911).

18. **C. albus** Dougl. White Globe Lily. (Fig. 56a, b.) Stem stout, glaucous, branching, 1 to 2 feet high; basal leaf elongated lanceolate, acuminate, 1 to 1½ feet long, ⅓ to 1⅜ inches wide; bracts foliaceous, 3 to 5 inches long; sepals shorter than the petals, ovate, acuminate, greenish-white; petals white, purplish at base, ovate-orbicular, acutish, with scattering long silky yellow hairs above the gland, 1 to 1¼ inches long; gland lunate, shallow, with 4 transverse scales, the scales upwardly imbricate, shortly fringed; anthers oblong, mucronate; capsule 1 to 2 inches long, ½ to 1 inch broad, abruptly short-beaked; seeds brown, pitted.

Wooded slopes and cañons: Coast Ranges near the coast from the Santa Cruz Mts. southwards; San Gabriel and Cuyamaca mountains in Southern California

(rare southwards); Sierra Nevada from Butte Co. southwards. May. Called Snow-drops in Tuolumne and Calaveras cos., Indian Bells in Calaveras Co., and Satin Bell in the Coast Ranges.

Locs.—South Coast Ranges: Burlingame, *M. S. Baker*; Niles; Los Gatos, *Heller*. Southern California: Ojai Valley, *Olive Thacher*; Little Santa Anita Cañon, San Gabriel Mts., *Peirson* 2163; Fish Cañon, San Gabriel Mts., *Peirson*; Claremont, acc. *I. M. Johnston*; Palomar, *Hall* 1937; Cuyamaca Mts., *Parish* 4422 (some petals with fringed margin like C. pulchellus); Santa Cruz. Isl., usually pale rose (Zoe, 2:78); Santa Rosa Isl., *T. Brandegee*. Sierra Nevada (plants somewhat smaller and the flowers apparently differing a little from the Coast Range form: Gwin Mine, Calaveras Co., *Jepson* 1773; Columbia, *Jepson* 6295.

Var. **rubellus** Greene. (Fig. 56c.) Generally lower and more slender; flowers rose-pink; gland scarcely arched, from the outside resembling a blood-blister.—Southern Sierra Nevada and the Santa Lucia and Santa Cruz mountains. June. Passes into the species.

Locs.—Samson Flats, Fresno Co., *Newhall*; Sand Creek, *Harriet Kelley*; Dunlap, *Jepson* 2768; Limekiln Creek, *Jepson*; Old Colony Mill, Sequoia Park, *Jepson* 642; Nelson, Middle Tule River, *Jepson* 4866; Lucia, Monterey Co., *Hall*; Ben Lomond (Zoe, 2:79).

Refs.—Calochortus albus Dougl.; Benth. Trans. Hort. Soc. Lond. ser. 2, 1:413, pl. 14, fig. 3 (1835), type from Cal., *Douglas*; Wood, Proc. Phila. Acad. 20:168 (1868); Jepson, Fl. W. Mid. Cal. 113 (1901); McB. Contrib. Gray Herb. 66:12 (1918). *Cyclobothra alba* Benth. l.c.; Lindl. Bot. Reg. t. 1661 (1835). Var. rubellus Greene, Erythea, 1:152 (1893), type loc. Pacific Grove, *Tidestrom*. Var. *amoenus* Purdy; Bailey, Stand. Cyclop. Hort. 2:632 (1914). *C. amoenus* Greene, Pitt. 2:71 (1890), type loc. Sierra Nevada east of Visalia, *Patterson*.

19. **C. monophyllus** Jepson. Yellow Star Tulip. (Fig. 56d-g.) Stem flexuous, branching, 3 to 8 inches high; basal leaf 9 to 12 inches high, 3 to 4 lines wide; bracts linear-lanceolate, acuminate, 2 to 4 lines wide; sepals narrowly ovate, acuminate, mucronate, about equaling petals; sepals and petals yellow or more or less purplish brown; petals obovate; gland semicircular, borne in a shallow pocket (appearing on the outside as a ridge) covered from below by a narrow laciniate scale, and densely bordered or crested above with short yellow (or the innermost white) hairs; hairs and laciniae of gland papillate; claw below the scale naked, often glandular, sometimes red-brown; capsule orbicular, 6 to 9 lines long.

Lower Yellow Pine belt of the Sierra Nevada from Shasta Co. to Tuolumne Co. Frequent. Apr. Petals 5 to 8 (or 9) lines long.

Locs.—Reed Road, Shasta Co., *M. S. Baker*; Brush Creek, Butte Co., *K. Conger*; Rough and Ready, Nevada Co., *Jepson*; Camino, El Dorado Co., *K. Brandegee*; Italian Bar, Tuolumne Co., *A. L. Grant*.

Refs.—Calochortus monophyllus Jepson, Madroño, 1:61 (1917). *Cyclobothra monophylla* Lindl. Jour. Hort. Soc. Lond. 4:81 (1849), type loc. Bear Valley, Nevada Co., *Hartweg* 371. *C. elegans* var. *lutea* Benth. Pl. Hartw. 338 (1857), type loc. Bear Valley, Nevada Co., *Hartweg* 371. *Calochortus benthamii* Baker, Jour. Linn. Soc. Bot. 14:304 (1874).

20. **C. caeruleus** Wats. Beavertail Grass. Stems short (1 to 7 inches high), the basal leaf 1 to 3 times as long; flowers 2 to 4 (or 10) in umbels; pedicels very slender; bracts small; petals rhombic-ovate, 3½ to 6 (or 7) lines long, white or pale blue, lilac-dotted and lined with blue, hairy, the margin fringed; gland narrow, transverse, curved, shallow, covered by an appressed somewhat fringed scale and crested by a row of short scales; these latter scales narrow, often hair-like, frequently laciniate or incised; capsule orbicular or nearly so, obtuse, 6 lines long.

Open woods, middle altitudes of the Sierra Nevada from El Dorado Co. to Shasta Co., and in the high North Coast Ranges from northern Lake Co. to Siskiyou Co. June.

Variation in gland: The narrow transverse gland is somewhat curved or lunate (Armstrong Sta., El Dorado Co., *Hansen* 1071; Blue Cañon, Placer Co., *H. A. Walker*; Nelson Pt., Plumas Co., *Hall* 9395; Marble Mt., *Chandler* 1646; Trinity Summit, *Jepson* 2035), rarely straight (Marble Mt., *Jepson* 2824), and varies in breadth from ⅓ to ¾ the width of the petal at the place of the gland in the specimens cited, even in the same lot of specimens (Marble Mt., *Jepson* 2824). These results do not sustain *C. nanus* Piper as distinct from C. caeruleus. C. caeruleus is most commonly found between 4000 and 7500 feet but occurs in typical form

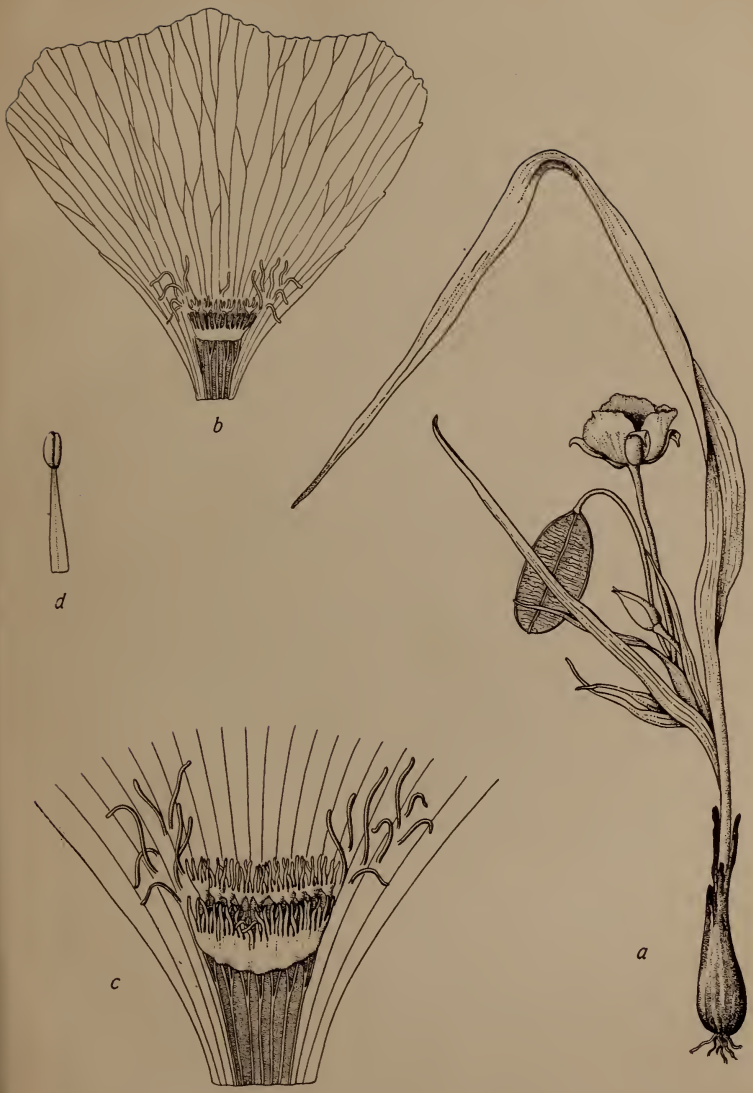

Fig. 57. Calochortus umbellatus Wood; *a*, habit, × 1; *b*, petal, × 4; *c*, gland, × 12; *d*, stamen, × 4.

as low as 2300 feet (Dunsmuir, *Hall & Babcock*). Specimens from Stirling (*Heller* 10812) and Old Cow Creek, Shasta Co. (*M. S. Baker*), have the usual curved type of gland, but in coloration and size of flowers represent certain of the stages in the gradual transition to the var. maweanus. This variety indeed is too close to C. tolmiei H. & A. of the Willamette Valley, somewhat as the species is very closely allied to C. elegans Pursh of Idaho. The fimbriae of the scale and the crest are covered with slender microscopic papillae in both the species and the variety. While the variation of the gland in the species as here accepted is marked, it is far less than in, for example, C. luteus.

Var. **maweanus** Jepson n. comb. PUSSY EARS. Sepals commonly very blue; petals purplish blue to white, 7 to 11 lines long, the margin entire or nearly so; gland horseshoe-shaped or semicircular, narrow, more or less pocketed; crest usually rather dense.—Marin Co. north through the Coast Ranges to Humboldt Co.

Locs.—Inverness, comm. by *Alice King*; Rowe's, Mendocino Co., *Chandler*; Kneeland Prairie, *Tracy*; Dows Prairie, *Tracy* 4813.

Refs.—CALOCHORTUS CAERULEUS Wats. Proc. Am. Acad. 14:263 (1879). *Cyclobothra caerulea* Kell. Proc. Cal. Acad. 2:4 (1863), type loc. Forest City, near Downieville. *Calochortus elegans* var. *nanus* Wood, Proc. Acad. Phila. 20:168 (1868), type loc. Yreka, *Wood*. *C. nanus* Piper, Bull. Torr. Club, 33:537 (1906); McBr. Contrib. Gray Herb. 66:12 (1918). Var. MAWEANUS Jepson. *C. mawcanus* Leicht.; Baker, Jour. Linn. Soc. Bot. 14:305 (1874), type from Cal., doubtless collected by Roezl; Jepson, Fl. W. Mid. Cal. 112 (1901); Purdy, Proc. Cal. Acad. ser. 3, 2:120 (1901). Var. *major* Purdy, l.c., a large form, Yellow Pine belt, Butte Co. *Cyclobothra elegans* Torr. Pac. R. Rep. 4:146 (1857). *Calochortus elegans* Hook. Bot. Mag. t. 5976 (1872), not Pursh.

21. **C. nudus** Wats. SIERRA STAR TULIP. Stem 2 to 6 inches high, flexuous, bearing a single umbel of 1 to 3 (or 9) flowers; basal leaf 3 to 10 inches long, 2 to 5 lines wide, light green; sepals oblong-elliptic, shorter than the petals; petals white or pale lilac-blue, cuneate or fan-shaped, acute, denticulate above, 4 to 7 lines long, generally without hairs, in some cases a very few slender hairs above the gland or a tuft of 2 or 3 short hairs at either end of the gland; scale transversely oblong, shortly fringed, appressed; crest none; claw below the scale somewhat glandular; anthers at first pale blue, linear, acute; capsule elliptic, generally nodding.

Open coniferous woods, high Sierra Nevada from Plumas Co. to Tulare Co. Also, apparently, in the San Gabriel Mts. June-July. The smallest-flowered Calochortus. Petals often with a flash of pink or purple above the gland.

Locs.—Warner Valley, Plumas Co., *Jepson* 4073; Cisco, *H. A. Walker*; Calaveras Big Trees, *A. L. Grant*; Center Camp near Confidence, *A. L. Grant*; Glacier Pt., Yosemite, *Jepson* 4344; Snow Creek, Fresno Co., *A. L. Grant* 1063; Round Mdw., Giant Forest, *Jepson* 673; Freeman Creek, Kern River, *Jepson* 4882a; (†) Mt. San Antonio, *Peirson* 289.

Var. **shastensis** Jepson n. comb. Stem 4 to 14 inches high, slender, flexuous, more or less erect; basal leaf shorter than, equal to, or longer than the stem; petals white, pale lilac blue to deep lilac, 6 to 10 lines long; capsule elliptic, generally erect, occasionally nodding.—Moist meadows; Sierra Nevada from Eldorado Co. north to Mt. Shasta; thence southwesterly to Trinity Co.

Locs.—Pyramid Peak, *Hall & Chandler* 4754; Kentucks, Shasta Co., *M. S. Baker* 439; McCloud, *I. J. Condit*; Sisson, *Hall & Babcock* 4067; Pin Creek, Trinity Co., *Hall* 8684.

Refs.—CALOCHORTUS NUDUS Wats. Proc. Am. Acad. 14:263 (1879), based on spms. from the northern Sierra Nevada. Var. SHASTENSIS Jepson. *C. shastensis* Purdy, Proc. Cal. Acad. ser. 3, 2:125 (1901), type loc. Sisson.

22. **C. umbellatus** Wood. (Fig. 57.) Stem 3 to 10 inches high, without bulblets, bearing 2 to 4 (or 12) flowers in 1 to 3 umbels subtended by leafy bracts, the pedicels long; herbage glaucous; sepals oblong, acuminate, greenish-white or slightly tinged with lilac; petals white or slightly lilac-tinged, cuneate or fan-shaped, slightly concave, 6 to 9 lines long; gland shallow, bowl-shaped in outline, covered from below by an appressed fringed scale and bordered by hairs on its upper side; petals otherwise naked save a hairy area (often with a purple spot below it) on each side of the gland; anthers short-oblong; capsule oblong-obtuse to orbicular, strongly nodding.

Low wooded or barren hills: region between San Ramon Valley and San Francisco Bay; Marin Co. to Mendocino Co. Mar.-Apr.

Locs.—Ft. Bragg, *W. C. Mathews*; Mt. Tamalpais, *Jepson* 7554, 8226; Berkeley, *Jepson*; Laundry Farm, *Purdy;* San Pablo Hills, *Hall*; Las Trampas, *Jepson.*

Refs.—Calochortus umbellatus Wood, Proc. Acad. Phila. 20:168 (1868), type loc. Oakland Hills, *Wood;* Jepson, Fl. W. Mid. Cal. 112 (1901). *C. collinus* Lemmon, Erythea, 3:49 (1895), type loc. Oakland Hills.

23. **C. uniflorus** H. & A. Low, 4 to 10 inches high, the stem very short (commonly rising only ¼ to 1 inch out of the ground) and bearing 1 to 3 umbels with elongated flexuous pedicels (2½ to 8 inches long); bulblets 1 to 4 beneath the surface; basal leaf 4 to 6 lines broad, exceeding the inflorescence; bracts linear-lanceolate, long and conspicuous; sepals ovate-lanceolate, greenish-lilac; petals lilac, cuneate, somewhat truncate, denticulate, 10 to 14 lines long, naked above, very sparingly hairy immediately above the gland; gland shallow, convexly crescent-shaped on lower side, truncate above, covered by an appressed lightly fringed scale and with a dense border of hairs above; anthers broadly linear; capsule elliptic.

Low wet valley lands: Mendocino and Lake cos. to Monterey Co. Apr.-May.

Locs.—Ridges west of Hupa, acc. *Tracy;* Round Valley, Mendocino Co., *Westerman;* Sherwood Valley, *Davy & Blasdale*; Kelseyville, *H. Irwin*; Calistoga, *Jepson*; Conn Valley, *Jepson* 6254; Sonoma, *Bioletti;* Pacific Grove, *Heller* 6729.

Refs.—Calochortus uniflorus H. & A. Bot. Beech. 398, t. 94 (1841), type from Cal., *Douglas*; Hooker, Bot. Mag. t. 5804 (1869); Jepson, Fl. W. Mid. Cal. 112 (1901). *C. lilacinus* Kell. Proc. Cal. Acad. 2:5 (1863), type loc. Calistoga.

24. **C. greenei** Wats. Stem scape-like, 10 to 17 inches high, bearing a 1 to 5-flowered umbel; basal leaf shorter than or equaling the stem, ½ inch broad; bracts narrow; sepals greenish, lilac within, ¾ the length of the petals; petals long fan-shaped, 1 to 1½ inches long, lilac, somewhat barred with yellow below, arched with a shallow gland pocket; pocket partly covered by a very narrow transverse fringed scale, and bordered above by a thick growth of hairs; lower half of petals above the gland with very sparse fine hairs 3 to 4 lines long; anthers oblong, obtuse, 2 lines long; capsule 1 inch long or somewhat shorter, orbicular to elliptic, attenuate into a stout beak, on stout flexuous or strictly erect pedicels.

Wet adobe, Siskiyou Co. to Modoc Co. Fringe of the scale and lower hairs of the border above the gland closely papillate.

Loc.—Forestdale, Modoc Co., *M. S. Baker.*

Ref.—Calochortus greenei Wats. Proc. Am. Acad. 14:264 (1879), type loc. Siskiyou Co., *Greene.*

18. **ERYTHRONIUM** L. Adder's Tongue

Stem short, simple, scapose, from a deep-seated and elongated membranous-coated corm. Leaves 2, basal or nearly so. (Before coming into flower, first or second year, the plants are stemless, producing simply one broad long-petioled leaf.) Flowers large, nodding, solitary, or several and racemose; perianth-segments distinct with longitudinal nectar-bearing groove and 2 or 4 sac-like or bulbous processes at base, or only the inner segments so provided. Stamens 6, hypogynous, shorter than the perianth. Style 3-cleft with 3 stigmas, or entire and stigma 1. Capsule somewhat 3-angled, loculicidal.—Species 12, North America and Europe. (Greek eruthros, red, the color of the flowers in some species.)

In the Erythroniums the bulb (corm) is annual. The bulb produced last summer will this spring develop the stem and leaves; during the summer a new bulb forms by its side, and by autumn the old bulb will have shrunk to a hard knotty scar, attached on the one side to the new bulb and on the other to a chain of like scars, which form a pseudo-rhizome representing the growth of preceding years.—Carl Purdy, Flora & Sylva, 2:250 (1904).

Bibliog.—Watson, S., Revision of the Am. Species of Erythronium (Proc. Am. Acad. 26:126–130,—1891). Baker, J. G., Note on Am. Erythroniums (Gard. Chron. ser. 3, 21:299,—1897). Purdy, C., Erythronium grandiflorum and related species (Gard. & For. 10:157,—1897); Western Erythroniums (Flora and Sylva, 2:250–256,—1904).

Inner perianth-segments without auricles or scales; flowers solitary or racemose.....
1. *E. purpurascens.*
Inner perianth-segments with auricles and a median pair of sacs, each joined laterally to the auricle by a narrow ridge or saccate process.
Scape bearing a solitary flower or when several the pedicels often very long or unequal.
Flowers purple; pedicels often very unequal, half to as long as the scape.....
2. *E. hendersonii.*
Flowers mostly cream, yellow or pink.
Filaments filiform or very narrowly dilated.
Style and stigma entire.....3. *E. citrinum.*
Style 3-cleft or 3-lobed at apex.
Leaves bright solid green.....4. *E. grandiflorum.*
Leaves strongly mottled.....5. *E. californicum.*
Filaments ovately scarious-winged.....6. *E. revolutum.*
Scape none, the flowers 1 to 5 in an umbel sessile between the leaves, each flower thus raised on a scape-like pedicel.....7. *E. hartwegii.*

1. **E. purpurascens** Wats. Three to 6 (or 16) inches high, the scape bearing 1 to 8 flowers in a raceme, the flowers commonly approximate, rarely with very unequal pedicels and umbellate; leaves not mottled, undulate-margined, dark metallic green; flowers light yellow, tinged purple after a few days, the linear segments 7 to 8 lines long, only slightly recurved; filaments filiform; style clavate, shorter than the stamens, its stigma obscurely lobed.

Sierra Nevada, Mt. Lassen to Tulare Co., brushy or forested slopes, 4000 to 8000 feet. Rare south of Plumas Co. June-July.

Locs.—Hot Springs Valley near Lassen Peak, *Jepson* 4079 (lower part of petals sulphur yellow, the upper part pure white and fading pink); Big Mdws., Plumas Co., *R. M. Austin*; Cisco, acc. *Purdy*; Mt. Moses, *Purpus.*

Refs.—ERYTHRONIUM PURPURASCENS Wats. Proc. Am. Acad. 12:277 (1877). *E. grandiflorum* var. *multiflorum* Torr. Pac. R. Rep. 4:146 (1857), type loc. Downieville, *Bigelow. E. purpurascens* var. *uniflorum* Wats. Bot. Cal. 2:171 (1880), resting on *E. grandiflorum* Torr. Pac. R. Rep. 4:145 (1857), type loc. Forest City near Downieville, *Bigelow.*

2. **E. hendersonii** Wats. Seven to 12 inches high, 1-flowered or with 2 to 4 flowers on pedicels half to as long as the scape; leaves mottled, long-oblong, obtuse or obtusish, or tapering from the middle upward; perianth purple, the segments very revolute, 1¼ to 1⅜ inches long, the base of segments with a median pair of inflated or bulbous sacs, each connected with the auricles by a small sac or papilla; stigma 3-lobed.

Siskiyou Co. North to southwestern Oregon.

Locs.—Quartz Valley, *Butler.* Grants Pass, Ore., *M. S. Baker.*

Ref.—ERYTHRONIUM HENDERSONII Wats. Proc. Am. Acad. 22:479 (1887), based on Oregon spms. (Ashland, *Henderson*, and Grants Pass, *Howell*).

3. **E. citrinum** Wats. Scape 1 to 3-flowered, 5 to 11 inches high; leaves "mottled," but not obviously so in our material, oblong, obtuse or acute, more or less undulate, 3 to 6 or 10 inches long; flowers lemon-yellow, the oblong acuminate segments 1 to 1¼ inches long; inner perianth-segments bearing at base a median pair of saccate protuberances, each joined laterally by a smaller sac or process to the auricle; style clavate at apex; style and stigma quite entire.

Open pine woods, central Sierra Nevada and southwestern Oregon. Apr.

Tax. Note.—Watson describes the appendages as "scales," but in dried specimens these "scales" of the delicate perianth-segments are portions of the formerly open sacs flattened by pressure.

Locs.—Italian Bar, Tuolumne Co., *Fred Grant*; Yankee Hill, *Jepson* 6407.

Ref.—ERYTHRONIUM CITRINUM Wats. Proc. Am. Acad. 22:480 (1887), type loc. Deer Creek Mts., Josephine Co., Ore., *Howell.*

4. **E. grandiflorum** Pursh var. **parviflorum** Wats. Scape 1 to 2 or 5-flowered; leaves bright green, without spots; flowers egg-yellow, at higher altitudes lemon-yellow; inner perianth-segments auricled and with 4 equal sacs at base, the sacs ridged, wrinkled or flattened and not very distinct from each other; style 3-cleft at apex or merely 3-lobed.

High montane in northern Humboldt Co. and in Siskiyou Co. North to British Columbia.

Locs.—Trinity Summit, *Jepson*, 2039; Marble Mt., *Jepson* 2826.

Refs.—ERYTHRONIUM GRANDIFLORUM Pursh, 1:231 (1814), type loc. Kamiah, Ida., *Lewis;* var. PARVIFLORUM Wats. Proc. Am. Acad. 26:129 (1891), based on high montane spms. from the western U. S. *E. parviflorum* Gooding, Bot. Gaz. 33:67 (1902).

5. **E. californicum** Purdy. FAWN LILY. Like preceding but leaves strongly mottled; flowers creamy white or somewhat yellowish, or white; median sacs 2, the lateral ones reduced to a transverse ridge.

Brushy or open hillslopes: northern Sonoma Co. to Humboldt and Trinity cos., 500 to 3500 feet. Mar.-Apr.

Locs.—Gualala River, *M. S. Baker;* Cloverdale, *Setchell;* Middletown grade, *Jepson;* Willits, *W. C. Mathews;* Blue Rock Ridge, *Jepson* 1880; Harris, *Ethel Tracy;* Kneeland Prairie, *Tracy* 4897 (flowers white); Burnt Ranch, acc. to *Purdy.*

Refs.—ERYTHRONIUM CALIFORNICUM Purdy, Flora and Sylva, 2:253 (1904), type loc. Ukiah, *Purdy. E. grandiflorum* Wats. Bot. Cal. 2:170 (1880), not Pursh. Purdy's species seem insufficiently distinct from the northern plant usually called E. giganteum Lindl. (Bot. Reg. sub. t. 1786,—1836, type loc. "Northwest America," *Douglas*), but he restricts the true E. giganteum to the region from Grants Pass, Ore., north to British Columbia.

E. HOWELLII Wats. Proc. Am. Acad. 26:130 (1891). Flowers light yellow, in age pale rose, "without auricles or scales."—Type loc. Waldo, Ore., *Howell.* Specimens of both Howell's first and second distribution show auricles and sacs ("scales"). On the other hand Purdy states that specimens from the Adams Mine 1 mile sw. of Waldo, probably the exact type station, are "entirely destitute of appendages."

6. **E. revolutum** Sm. Like E. californicum; scapes 1 or 2 (to 4)-flowered, 7 to 12 inches high; leaves lightly mottled; flowers bright pink or pale lavender, sometimes white, aging to purple; filaments broadly dilated, almost conniving around the ovary.

Woods, often on borders of swamps: Mendocino and Humboldt cos., 10 to 20 miles from the coast, 500 to 2500 feet. Northward to British Columbia.

Locs.—Navarro River, acc. *Purdy;* Kneeland Prairie, *Tracy* 3183, 4059, 4896; High Prairie, Bald Mt., *Tracy* 4938; Hupa, *Chandler* 1279.

Refs.—ERYTHRONIUM REVOLUTUM Smith, Rees' Cycl. 13. no. 3 (1809), type loc. Gulf of Georgia, British Columbia, *Menzies.* Var. *bolanderi* Wats. Proc. Am. Acad. 26:129 (1891), type loc. Mendocino redwoods, *Bolander.*

7. **E. hartwegii** Wats. Flowers solitary or borne in a 2 to 5-flowered umbel sessile between the pair of basal leaves, each flower thus appearing to be raised on a scape of its own; scape-like pedicels 3 to 6 inches high; corms forming offsets freely at the end of filiform filaments originating from their base; leaves richly mottled; flowers white or cream with orange or yellow base; inner perianth-segments with a median pair of compressed sacs and with prominent auricles; stigma 3-lobed or -parted.

Brushy hillsides: Sierra Nevada foothills, Tehama Co. to Mariposa Co. Apr. Our only species which has offsets.

Locs.—Rough and Ready, Nevada Co., *Jepson;* Auburn, *Bolander;* Mariposa, *Congdon.*

Refs.—ERYTHRONIUM HARTWEGII Wats. Proc. Am. Acad. 14:261 (1879), resting first on *E. grandiflorum* Benth. Pl. Hartw. 339 (1857), type loc. Sierra Nevada foothills in Tehama Co., near Pine Creek, *Hartweg* 288.

19. FRITILLARIA L.

Stem erect, simple, from a bulb of one or few thick fleshy scales. Cauline leaves alternate or whorled, narrow, sessile; basal leaves large, ovate or elliptic, borne only in the year or years before the flowering stalk appears. Flowers in racemes or solitary, dull purple, brownish, whitish or red. Perianth campanulate to funnel-form, deciduous, of 6 distinct segments, each segment usually with a shallow gland or nectar-bearing area above the base. Stamens 6, inserted on the base of the segments, included; filaments slender; anthers extrorse, more or less

versatile. Ovary sessile or nearly so. Style 1, entire or 3-parted. Capsule membranous, 6-angled or winged, loculicidally 3-valved. Seeds numerous, in 2 rows in each cell.—About 50 species, northern hemisphere. Our species bear a minute tuft of glandular hairs at apex of the perianth-segments. (Latin fritillus, a dice-box, on account of the shape of the flower.)

A. Style entire (or 3-parted at the very apex in no. 3); perianth of uniform color, its glands obscure.

Flowers yellow; plants 3 to 9 inches high.....1. *F. pudica.*

Flowers pink or pink-purple.

Perianth ¾ to 1 inch long; plants 10 to 30 inches high.....2. *F. brandegei.*

Perianth 1 to 1⅜ inches long; plants 6 to 12 inches high.....3. *F. pluriflora.*

B. Style deeply 3-cleft; perianth-glands mostly obvious.

Stem leafy only on lower half, the larger leaves mostly basal; odor often obnoxious; perianth evenly shaded, not mottled or checkered (except no. 6).

Stem 3 to 12 inches high.

Flowers dull white.....4. *F. liliacea.*

Flowers not white.

Flowers dark brownish or greenish purple.....5. *F. biflora.*

Flowers shaded with pink, checkered purple.....6. *F. purdyi.*

Stems 12 to 20 inches high; flowers yellowish green.....7. *F. agrestis.*

Stem leafy above, the lower half or third naked.

Perianth evenly shaded, not mottled or checkered, at least not commonly.

Flowers more or less purplish or greenish, often lighter within; segments obovate-oblong.....8. *F. parviflora.*

Flowers green; segments lanceolate.....9. *F. viridia.*

Perianth mottled or checkered.

Flowers scarlet; style cleft ⅛ to ⅓ its length.....10. *F. recurva.*

Flowers brownish purple; style cleft to below the middle.

Leaves ovate-lanceolate; perianth-segments 1 to 1½ inches long.....11. *F. lanceolata.*

Leaves linear; perianth-segments ½ to ¾ inch long.

Stem slender or equably developed in proportion to the leaves; capsule acutely angled.....12. *F. atropurpurea.*

Stem stout, much thickened in proportion to the leaves; capsule with horn-like processes at the base and summit of each valve.....13. *F. pinctorum.*

1. **F. pudica** Spreng. YELLOW FRITILLARY. Stem 3 to 9 inches high, 1 to 3-flowered; bulb-scales very small and rounded; leaves 3 to 8, narrowly oblanceolate, alternate, borne generally on upper half of stem; perianth yellow or orange, often purple tinged outside, the segments oblong-obtuse to obovate-oblong, 5 to 9 lines long, the glands at base very small; stigma very shortly 3-lobed; capsule obovoid-oblong, ⅔ inch long.

Sierra Co. to Siskiyou Co., mostly east and north of the Sierra Nevada crest, 5000 to 6000 feet. North to British Columbia, east to Utah. Apr.-May. Flowers turning brick-red and recurving in age.

Locs.—Mohawk Valley, *Minor*; Rocky Comfort School, nw. Lassen Co., *Louise Scroggy*; Lassen Creek, *R. M. Austin*; Alturas, *Goldsmith* 48; Ft. Bidwell, *Manning*; Rhett Lake, *Manning*; Goose Valley, Shasta Co., *M. S. Baker*; Yreka, *Butler* 1121; Fort Jones, *Anna Conan.*

Refs.—FRITILLARIA PUDICA Spreng. Syst. 2:64 (1825); Baker, Journ. Linn. Soc. 14:267 (1874). *Lilium? pudicum* Pursh, Fl. 1:228, t. 8 (1814), type loc. headwaters Missouri River, *Lewis.*

2. **F. brandegei** Eastw. Stem stout, glabrous, 10 to 30 (?) inches high, about 7-flowered; leaves on upper half of stem, in 2 whorls of 5 to 9, oblong-lanceolate, 3 to 4 inches long, ½ to ¾ inch wide; flowers pinkish or purplish, campanulate with obtuse base, borne on recurved rather thick pedicels; perianth-segments ¾ to 1 inch long, oblong-lanceolate, becoming involute and spreading; glands obscure; filaments subulate; style exceeding the stamens, entire, with stigma scarcely lobed; capsule winged, truncate.

In the Yellow Pine belt, Tule River basin, 5000 feet. Insufficiently known.

Loc.—Bear Creek, Tulare Co., *Purpus.*

Ref.—Fritillaria brandegei Eastw. Bull. Torr. Bot. Club 30:484 (1903), type loc. Coburn Mill, Bear Creek, on North Fork, Tule River, *T. Brandegee.*

3. **F. pluriflora** Torr. Adobe Lily. Stems 6 to 12 inches high, leafy chiefly at base, 1 to 7-flowered; bulb somewhat yellowish, its scales few (6 to 8), ½ to 1 inch long; leaves 4 to 10, oblong-lanceolate; perianth uniform pink-purple, the segments obovate-oblong, acutish, 1 to 1⅜ inches long; style 3-parted at apex; capsule as broad as long, truncate at apex, narrowed toward the base, strongly 3-lobed, each lobe with 2 longitudinal dorsal ridges or wings with intervening depression.

Adobe soil in the foothills bordering the Sacramento Valley: Solano, Yolo and Butte cos. Feb.-Mar. Also called Pink Fritillary.

Locs.—Vacaville, *Jepson* 5303; Sweeney Creek, Solano Co., *R. H. Platt*; Clear Creek, Butte Co., *H. E. Brown* 141.

Refs.—Fritillaria pluriflora Torr.; Benth. Pl. Hartw. 338 (1857), based on *Fremont* 313 (Feather River) and *Hartweg* 258 (Sierra foothills, n. Butte Co.); Jepson, Fl. W. Mid. Cal. 107 (1901).

4. **F. liliacea** Lindl. White Fritillary. Stem 3 to 10 (or sometimes 12) inches high, often somewhat stout and succulent, 1 to 5-flowered; leaves of the basal tuft linear to oblong-lanceolate, ¼ to ¾ inch broad, 1¼ to 4½ inches long, the cauline leaves few, linear-oblong or linear; flowers dull white; perianth-segments oblong-ovate to obovate, 6 to 9 lines long; gland greenish, purplish-dotted, the greenish veins sometimes glandular nearly or quite to the apex of the segments; style cleft to about the middle; capsule stipitate, truncate at each end, ½ inch long and as broad, the back of each lobe slightly channeled and 2-ridged.

Open hilltops near the coast from San Francisco Bay to Monterey Co. Mar.-Apr.

Locs.—Pfeifer's Pt., Monterey coast, *Marion Parsons*; Carmel Bay, *F. G. Woodcock* (odor disagreeable like F. agrestis); Redwood City, *Jepson* 5732; Hillsboro, *Inez Smith*; Potrero Hills, San Francisco, *Dunn* (dwarfed); San Leandro, *A. E. Wieslander*; Stege (*Davy* 6530) and Point Richmond (*Tracy* 612), growing in low ground, tall, succulent, with narrow leaves.

Refs.—Fritillaria liliacea Lindl. Bot. Reg. sub t. 1663 (1835), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 109 (1901).

5. **F. biflora** Lindl. Mission Bells. Stem stout, 4 to 10 (rarely 12) inches high, 2 to 4 (rarely 1, less rarely as many as 7)-flowered; leaves 2 to 7, scattered or somewhat whorled below, oblong to ovate-lanceolate, 2 to 4 inches long, ¼ to 1¼ inches wide; perianth campanulate, 8 to 12 lines long, dark brownish or greenish-purple; segments oblong-lanceolate, with a longitudinal greenish glandular band extending from the base nearly to the apex; style cleft to about the middle; capsule nearly 1 inch broad, and not quite as high.

Southern California (cismontane region) northerly to San Luis Obispo Co.; apparently localized also in the North Coast Ranges. Also called Chocolate Lily and Black Lily.

Locs.—San Diego, *Cooper;* Winchester, Riverside Co., *Hall* 384; San Dimas, *Chandler*; Los Angeles, *C. J. Fox*; San Luis Obispo, *J. A. Metzler*; (?) Ukiah, *Bolander.*

Var. **inflexa** Jepson n. var. Longitudinal band much thickened at apex, especially on the inner perianth-segments and inflexed in such a way as to form a channel at apex on the back of the segments.—(Segmenta perianthii virga media ad apicem crassiore, inflexa.)—Palisades region, Calistoga, *Elizabeth C. Wright* (type). Var. **ineziana** Jepson n. var. Stem slender, 1 or 2-flowered; leaves linear-oblong to lanceolate, 2 to 3 inches long, 2 to 4 lines wide; perianth-segments widely spreading, often faintly mottled with yellow; odor very disagreeable.—(Caulis tenuis, 1–2-floribus; folia lineari-oblonga vel lineari-lanceolata; odor nauseosus.)—San Mateo Co.: Hillsboro, *Inez Smith* (type). Intermediate between the species and F. purdyi. Also closely allied to F. liliacea.

Refs.—Fritillaria biflora Lindl. Bot. Reg. sub t. 1663 (1835), type from Cal., *Douglas. F. lanceolota* Torr. Bot. Mex. Bound. pl. 61 (1859). *F. succulenta* Elmer, Bot. Gaz. 41:311

(1906), type loc. Hernandez, San Benito Co., *Laura M. Lathrop*; leaves succulent, covered with a bloom.—Ex. char. Var. INFLEXA Jepson. Var. INEZIANA Jepson.

6. **F. purdyi** Eastw. Stem 4 to 9 inches high, 1 to 7-flowered; basal leaves ovate to oblong, obtusish, 1¼ to 2¼ inches long, the upper linear; flowers white and purple mottled, shaded with pink; style cleft about to the middle.

Humboldt and Trinity cos.

Loc.—Lewiston, *Wendell Philips*.

Ref.—FRITILLARIA PURDYI Eastw. Bull. Torr. Bot. Club 29:75, pl. 6 (1902), type loc. Kneeland, Humboldt Co., *C. Lowe*.

7. **F. agrestis** Greene. STINK BELLS. Stem from very deep-seated bulb, 12 to 20 inches high, leafy on the lower half; leaves 8 to 12, oblong-oblanceolate to linear-lanceolate, alternate or the lower somewhat whorled; raceme 3 to 8-flowered, the flowers exactly campanulate, nodding on pedicels abruptly recurved at summit; perianth-segments 1 to 1¼ inches long, 4 to 5 lines wide; yellowish green, with prominent or ligulate green band running nearly to the apex, distinctly glandular at base, and more or less glandular above; style cleft to about the middle.

Grain fields, region of the lower San Joaquin and Sacramento rivers. Odor very obnoxious.

Locs.—Turlock, comm. *Edith M. Wickes*; e. side of Mt. Diablo, *Linda Gehringer*; Antioch, *Davy* 987; Sacramento Co., *J. Durham* (1-flowered dwarf).

Refs.—FRITILLARIA AGRESTIS Greene, Erythea 3:67 (1895), type loc. Antioch, *Greene*; Jepson, Fl. W. Mid. Cal. 109 (1901).

8. **F. parviflora** Torr. BROWN BELLS. Stem 1¼ to 2½ feet high; bulb with numerous rice-grain bulblets; leaves linear to linear-lanceolate, 2½ to 4 inches long, 3 to 4 lines wide, borne on the upper half of the stem, the lower ones 3 to 5 in a whorl, the upper whorled or alternate; raceme long, with 4 to 10 campanulate flowers on short recurved pedicels; perianth 4 to 6 lines long, purplish or greenish white to greenish purple, often lighter inside, rarely faintly mottled, the veins evident, darker; segments obovate-oblong, obtuse to acuminate, with oblong-lanceolate glands on lower third; stamens with subulate filaments, ⅔ as long as the segments and a little shorter than the style; style cleft ⅓ to ⅔ its length, the terminal flowers often (or occasionally several or all the flowers) with pistil less than half developed; ovary and capsule broadly winged.

Pine woods: Sierra Nevada from Yuba Co. to Tulare Co., 1500 to 3900 feet; occasional in the inner Coast Range.

Locs.—Sierra Nevada: Penn Valley, Nevada Co., *Jepson*; Squaw Valley, Placer Co., *L. S. Smith*; New York Falls, Amador Co., *Hansen* 51; Avery, Calaveras Co., *A. L. Grant*; Gwin Mine, Calaveras Co., *Jepson* 1788; Yankee Hill, Tuolumne Co., *Jepson* 6404; Kinsley, Mariposa Co., *Charlotte Hoak*; Sequoia Mills (Millwood), *Eastwood*; Marble Fork, Kaweah River, *Hopping* 303. Coast Ranges: Hollister, *Bettys*; Mt. Diablo, *Jepson* 7573.

Refs.—FRITILLARIA PARVIFLORA Torr. Pac. R. Rep. 4:146 (1857), type loc. Murphy's, Calaveras Co., *Bigelow*. Not *F. parviflora* Mart. (1838). *F. micrantha* Heller, Muhl. 6:83 (1910).

9. **F. viridia** Kell. Stem 8 to 20 inches high, 3 to 6-flowered; bulb ¼ to ½ inch in diameter, its scales round and thick; leaves lance-linear, subacute, 1½ to 2½ inches long in 1 or 2 whorls on the upper half of the stem; flowers pendent on short pedicels, pale green to almost black, campanulate, 5 to 7 lines long; perianth-segments lanceolate, somewhat chartaceous; gland dark green, lanceolate, extending from the base and continued less distinctly to the apex, or quite obscure; apical tuft of hairs short, dense, white, glandular; anthers minutely but distinctly mucronate; style 3-cleft to about the middle; ovary cylindrical, acutely angled; capsule not seen.

San Carlos Range. A local and long-neglected species, but perhaps too near the preceding.

Loc.—San Benito Peak, *Jepson* 2714.
Ref.—Fritillaria viridia Kell. Proc. Cal. Acad. 2:9 (1863), type loc. New Idria, *Veatch.*

10. **F. recurva** Benth. Scarlet Fritillary. Stem stout, 18 to 30 inches high; bulb large and flattish, its scales numerous and thick, with rice-grain bulblets at base; leaves in 2 or 3 whorls near the middle of the stem, linear to linear-lanceolate, 2 to 6 lines broad; flowers 3 or 4 (to 6); perianth campanulate-funnelform, 1 to 1½ inches long, scarlet-checked upon yellow, the scarlet becoming crimson and purple in old flowers, the segments recurving strongly at the tips; gland oblong, 3 lines long, slightly depressed; style slender, 3-cleft ⅙ to ⅓ its length.

Northern Sierra Nevada (Placer Co. northerly to Modoc Co.); Coast Ranges (Mendocino Co. to Siskiyou Co.). North to Oregon.

Locs.—Butterfly Valley, Plumas Co., *R. M. Austin* 303; Hatchet Creek, Shasta Co., *Baker & Nutting;* Modoc. Co., *M. S. Baker;* Yreka, *Butler* 1191; Sisson, *L. S. Smith;* Buck Mt., *Tracy* 4176; Round Valley, *Westerman;* Long Valley, *Bolander* 4708.

Var. **coccinea** Greene. Stems commonly more slender, 10 to 20 (or 30) inches high, 1 to 3 (or 5) -flowered; bulb small, higher than thick, its scales 2 to several; flowers scarlet, mottled with yellow; segments with tips generally not recurved.—Hoods Peak and Napa ranges; north to eastern Mendocino Co.: Middletown grade, Mt. St. Helena, *Jepson;* St. Helena, *Jepson;* Red Mt., se. of Ukiah, acc. Purdy; Eden Valley, acc. Purdy.

Refs.—Fritillaria recurva Benth. Pl. Hartw. 340 (1857), type loc. Sierra Nevada foothills, n. Butte Co., *Hartweg* 294; Baker, Bot. Mag. t. 6264 (1876). Var. coccinea Greene, Pitt. 2:230 (1892), type loc. Hoods Peak, Sonoma Co., *Bioletti. F. coccinea* Greene, l.c. 250.

11. **F. lanceolata** Pursh. Checker Lily. Stem 1½ to 2 (or 3) feet high; scales few or none, the lower portion of the solid bulb covered with numerous rice-grain bulblets; leaves 6 to 10 in 2 or 3 whorls on the upper part of the stem, ovate-lanceolate, 2 to 4 inches long; raceme 1 to 4, sometimes to 13-flowered; perianth deeply bowl-shaped, 1 to 1½ inches long, dark purple mottled with greenish yellow, the segments ovate to oblong, deeply concave, with a very large ovate-lanceolate gland in the middle of the concavity; gland deep green, sharply defined, often with minute black dots; style cleft to below the middle; capsule broadly winged, ⅔ inch long.

Near the coast, on oak-covered or brushy hills: San Mateo Co. north to Humboldt Co. Northerly to British Columbia and Idaho. Also called Rice-root Lily.

Locs.—Lake Pilarcitos, *Davy* 1056; San Francisco, *A. L. Grant;* Inverness, *Jepson* 502b; Long Valley, Mendocino Co., *Bolander* 4707; Kneeland Prairie, *Tracy* 2640; Eureka, *Tracy* 4419; Hupa, *Manning;* Quartz Valley, Siskiyou Co., *Butler* 1225.

Var. **floribunda** Benth. Raceme 2 or 3 to several flowered; perianth campanulate, purple or greenish, conspicuously spotted or checkered, 6 to 13 lines long; segments broadly oblong or narrowly ovate, crisped or erosulate-margined, the outer often broader; gland greenish, extending from the base ½ or ⅔ the way to the apex.—Shady woods, Coast Ranges from Santa Clara Co. north to Lake Co.

Locs.—Loma Prieta, *Davy* 671; Los Gatos, *Heller* 7271; Crystal Springs Lake, *C. F. Baker* 430; Livermore Valley, *Hall* 1629; Grizzly Peak, *Davy* 118; Mt. Tamalpais, *Chandler* 275; Santa Rosa, *M. S. Baker* 722; Glen Ellen, *M. L. Douglass;* Vaca Mts., *Jepson;* Middletown grade, Mt. St. Helena, *Jepson;* Kelseyville, *Irwin* 101.

Var. **gracilis** Wats. Flowers smaller than the last, with narrow and more acuminate segments; stamens short and anthers often small.—Marin Co. to Napa Co.: Angel Isl., *F. P. McLean;* Napa Range near Calistoga, *Jepson.*

Var. **tristulis** A. L. Grant n. var. Perianth scarcely mottled, gland black-purple, not dotted. —Near the coast in Marin Co., *A. L. Grant* (type).

Refs.—Fritillaria lanceolata Pursh, Fl. 230 (1814), type loc., headwaters of the Columbia River, *Lewis;* Jepson, Fl. W. Mid. Cal. 108 (1901). Var. floribunda Benth. Pl. Hartw. 338 (1857). *F. mutica* Lindl. Bot. Reg. sub t. 1663 (1835), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. l.c. *F. lanceolata* Hook. Fl. Bor. Am. 2:181 t. 193 (1839), not Pursh. Var. gracilis Wats. Proc. Am. Acad. 14:259. *F. lanceolata* var.(?) Benth. Pl. Hartw. 340 (1857), type loc. Corte Madera, *Hartweg* 218. *F. mutica* var. *gracilis* Jepson l.c. Var. tristulis A. L. Grant.

12. **F. atropurpurea** Nutt. Stem ½ to 1½ feet high from a thick-scaled bulb; leaves 7 to 14, on the upper half of the stem, alternate or more or less whorled, narrowly linear, sessile, 2 to 4¼ inches long; flowers open-campanulate, 1 to 4 (rarely 5 or 6) on recurved pedicels; segments purplish-brown mottled with yellowish-green, narrowly rhombic or oblong and tapering to base and apex, ½ to ¾ inch long; style cleft ¾ its length; capsule acutely angled.

High North Coast Ranges, Sierra Nevada and San Bernardino Mts., 6000 to 10,500 feet; northerly to Oregon and Montana.

Locs.—Salmon Summit, *Jepson* 2077; Dorleska, Trinity Co., *Hall* 8574; Marble Mt., *Jepson* 2831; Humbug Mt., *Butler* 1261; Modoc Co., *M. S. Baker*; Mt. Lassen, *Hall & Babcock* 4301; Mt. Lyell, *Hall & Babcock* 3562; Marble Fork, Kaweah River, *Hopping*; San Bernardino Mts., acc. *Parish* (Pl. World, 20:209). A dwarf form is the var. **falcata** Jepson n. var. Three inches high; leaves mostly basal, broadly linear, falcate; flowers 2 or 3.—(Unc. 3 alta; folia plerumque basalia, late linearia, falcata; flores 2 vel 3.)—San Carlos Range (San Benito Peak, *Jepson* 2715, type).

Refs.—FRITILLARIA ATROPURPUREA Nutt. Journ. Acad. Phila. 7:54 (1834), type loc. Flathead River, n. Rocky Mts., *Nuttall*. Var. FALCATA Jepson.

13. **F. pinetorum** Davidson. Stem stout or even somewhat fistulous, 5 to 14 inches high; bulb with numerous rice-grain bulblets; leaves 12 to 20, approximate in somewhat indefinite whorls, linear, noticeably narrow in contrast to the stoutness of the stem; flowers 3 to 8, on upright pedicels slightly flexuous at first but becoming stout and stiff; segments dark greenish purple and yellow, mottled, broadly ovate-acuminate, obtuse at very apex, about ½ inch long; gland indefinite; filaments narrowly subulate; style 3-cleft half its length or more; capsule acutely angled with short horn-like processes at the base and summit of each valve.

Pine forests, 6000 to 9000 feet: White Mts. and southern Sierra Nevada southerly to the San Gabriel and San Bernardino mts.

Locs.—Campito Mt., *Jepson* 7292; Casa Diablo, Owens Valley, *Almeda Nordyke*; Long Mdw., North Fork Kings River, *Hall & Chandler* 4421½; Kern Peak, *Mary Haskell*; Mt. Pinos, *Hall* 6517; Swartout Cañon, Mt. San Antonio, *Hall* 1507.

Ref.—FRITILLARIA PINETORUM Davidson, Muhl. 4:67 (1908), type loc. Mt. Cummings, Kern Co., *Hasse & Davidson* 1739.

20. **LILIUM** L. LILY

Stems simple, tall and leafy, from a scaly bulb or scaly rootstock. Leaves narrow, sessile. Flowers large and showy, solitary or 2 to many in a terminal raceme. Perianth most commonly funnelform; its segments 6, yellow, red or white, often dotted or spotted with brown, distinct, equal, spreading or recurved, with a nectar-bearing groove toward the base. Stamens 6, hypogynous, included; anthers versatile. Style one, long, deciduous; stigma 3-lobed. Capsule loculicidal; seeds numerous, flat, horizontal, in 2 rows in each cell.—Species about 45, north temperate zone. (Greek lilion, the classical name.)

Lilies inhabiting dry slopes do not have jointed scales, while jointed scales characterize the wet land species. Lilies in cold or shaded places do not perfect as much seed as in opener spots but the joints of the bulb-scales are wonderfully adapted to propagation. If a jointed bulb is disturbed it replants itself many-fold (Carl Purdy).

Bibliog.—Elwes, H. J., Monog. of the Genus Lilium (1880). Purdy, C., Pacific Coast Lilies (Gard. & For. 10:43, 144, 326,—1897); New West American Lilies (Erythea, 5:103–105,—1897); Lilies of the Western U. S. and British Columbia (Jour. Roy. Hort. Soc. 26:351–362, figs. 183–186,—1904). Hansen, Geo., Lilies of the Sierra Nevada (Erythea 7:21–23,—1899). Waugh, F. A., Conspectus of the Genus Lilium (Bot. Gaz. 27:235–254, 340–360, figs. 1–14,—1899).

A. Plants of dry places with true bulbs (not rhizomatous); bulb-scales not jointed.

Flowers white (aging purplish or rose-purple) or pink.

Perianth pure white or minutely purple-dotted, aging purplish, 3 to 4 inches long, its segments slightly recurved at tip.....1. *L. washingtonianum.*

Perianth nearly white, brown-dotted, aging rose-purple, 1½ to 2 inches long, its segments recurving from the middle.....2. *L. rubescens.*

Perianth pink, its segments revolute to the stem.....3. *L. kelloggii.*

Flowers not white.
Perianth dark brownish-red to dingy purple.....4. *L. bolanderi.*
Perianth orange or yellow.
Leaves undulate; perianth-segments 2½ to 4 inches long, recurved ¾ their length.....
5. *L. humboldtii.*
Leaves plane; perianth-segments 1¼ to 2 inches long, recurved ⅔ their length.....
6. *L. columbianum.*

B. Plants of bogs or wet places; bulb rhizomatous, its scales jointed.

Flowers red or orange.
Flowers dark red, purple-spotted within, tips of segments recurved; rhizome not branching
7. *L. maritimum.*
Flowers orange-red or orange-yellow, dotted or spotted with dark purple.
Rhizome not branching.
Upper ⅔ of perianth-segments at length recurving to the pedicel; scales 1 or 2-jointed.....8. *L. occidentale.*
Perianth-segments recurving only at tip; scales 3 or 4-jointed.....9. *L. parvum.*
Rhizome commonly branching, its scales commonly 2-jointed; perianth-segments fully revolute.....10. *L. pardalinum.*
Flowers clear lemon-yellow; rhizome not branching, its scales 3 or 4-jointed.....11. *L. parryi.*

1. **L. washingtonianum** Kell. WASHINGTON LILY. Stem commonly 4 to 6 feet tall, the bulb ovate, scales not jointed; flowers pure white, often minutely purple-dotted, aging purplish; perianth tubular-campanulate, 3 to 4 inches long, the segments spreading above, not closely approximate in a tube; stamens a little shorter; anthers yellow, 5 to 6 lines long; capsule obovate-oblong, truncate, obtusely 6-angled or sometimes narrowly winged.

Central and northern Sierra Nevada, 3000 to 6000 feet, in the upper pine forests or in thickets, north to Mt. Shasta, thence westerly to northeastern Humboldt Co. Oregon. Aug. Flowers delightfully fragrant with the odor of pinks.

Locs.—Dinkey Grove, Fresno Co., *A. L. Grant* 1186; Yosemite Park, *Jepson* 4643 (Crane Creek), 3494 (Merced Big Trees); Sierraville, *Alma Ames* 6; Mt. Shasta, *Jepson*; South Fork Mt., Humboldt Co., acc. *Drew*; Bald Mt., Humboldt Co. (purple-tinted), acc. *Purdy*. Not reported from the southern Sierra Nevada, and probably does not occur in Southern California or the South Coast Ranges.

Refs.—LILIUM WASHINGTONIANUM Kell. Proc. Cal. Acad. 2:13 (1863), type from the Sierra Nevada, *Kellogg*, who named it in honor of Martha Washington as "Lady Washington Lily"; Elwes, Monog. Lil. pl. 10 (1880); Drew, Bull. Torr. Club, 16:148 (1889). Var. *purpureum* Baker, Jour. Linn. Soc. 14:233 (1874), type from Yosemite, is the not uncommon purple-tinted form acc. Purdy.

2. **L. rubescens** Wats. CHAPARRAL LILY. Stem 2 to 5 feet high; bulbs ovoid, rhizomatous, the scales not jointed; leaves broadly oblanceolate or obovate, mostly acute, 5 to 10 in a whorl, or the lower scattered; flowers several, nearly white, somewhat dotted with brown, aging to rose-purple; segments 1½ to 2 inches long, the upper ⅓ revolute; capsule obovoid with subtruncate apex and abruptly short-attenuate base, wing-angled, 1¾ inches long.

Chaparral slopes in the Coast Ranges, Santa Cruz Co. to Siskiyou Co. Near the coast called Redwood Lily; towards the interior Chaparral or Chamise Lily.

Locs.—Santa Cruz Mts., *Jepson*; Howell Mt.; Comptche, *H. A. Walker* 275; Kenny's, *Jepson* 2157; Bald Hills, near Hupa, *Manning* 319; Salmon Summit Trail, *Jepson* 2091.

Refs.—LILIUM RUBESCENS Wats. Proc. Am. Acad. 14:256 (1879); Jepson, Fl. W. Mid. Cal. 110 (1901). *L. washingtonianum* var. *purpureum* Masters, Gard. Chron. ser. 2, 2:322, fig. 67 (1874), material from Humboldt Co.; Elwes, Monog. Lil. pl. 11 (1880).

3. **L. kelloggii** Purdy. Bulb like that of L. rubescens; flowers 1 to 15; perianth-segments revolute to the stem, pink, dotted purplish-black or maroon, changing to deeper rosy purple, sometimes with a central line of yellow.

Inner margin of the Redwood belt, northern Mendocino Co. to Del Norte Co. Late June, July.

Locs.—Del Norte Co. (Patrick Creek); Humboldt Co., acc. Purdy; Red Mt., nw. Mendocino Co., *Bolander* (who first discovered it).

Ref.—LILIUM KELLOGGII Purdy, Garden, 59:330 (1901), type loc. Kneeland Prairie. Purdy regards this as the most distinct of the newer lilies.

4. **L. bolanderi** Wats. Stem ½ to 2½ feet high, 1 to 7-flowered; bulb ovate, of numerous lanceolate scales 1 to 1½ inches long; leaves in 3 (or rarely 4) whorls with 1 to 3 smaller alternate leaves below, oblanceolate to obovate, acute to obtusish, 1 to 2½ inches long, ¼ to 1⅛ inches wide, glaucous beneath; flowers horizontal or somewhat nodding, dark brownish-red to lurid purple, becoming somewhat paler, spotted; segments 1¼ to 1¾ inches long, barely recurving.

Dry chaparral hillsides, inside the Redwood belt, Mendocino Co. to Siskiyou Co. Southern Oregon. July.

Locs.—South Fork Smith River, *Jepson* 2891; near Preston Peak, *Jepson* 2886; Siskiyou Mts., *Blasdale* 1073.

Refs.—LILIUM BOLANDERI Wats. Proc. Am. Acad. 20:377 (1885), in reality based solely on material from Siskiyou Mts., *Howell*, acc. *Purdy*, Garden, 59:330 (1901), and distinct from Bolander's Red Mt. plant which is L. kelloggii Purdy.

5. **L. humboldtii** Roezl & Leicht. HUMBOLDT'S LILY. Stem commonly 3 to 5 feet high, very stout, its leaves generally purplish and slightly undulate, in 4 to 6 whorls; bulb large, ovoid, more or less oblique, its scales not jointed; flowers large, 2½ to 4 inches long, orange-red, spotted with small maroon or purple spots, the segments strongly recurving.

Open woods in lower Yellow Pine and upper chaparral belts of the Sierra Nevada and cismontane Southern California, 3000 to 6000 feet. Bulb-scales possessing a remarkably bitter principle.

Locs.—Rattlesnake Bar, Eldorado Co., *Sonne*; Jackson, *Hansen*; Tehipite Valley, Fresno Co., *Hall & Chandler* 484; San Bernardino Mts., acc. Parish (Pl. World, 20:208); Fish Cañon, San Gabriel Mts., *Peirson* 515.

Var. **bloomerianum** Jepson n. comb. Bulb scales several-jointed; claws of inner perianth-segments somewhat crested.—Cuyamaca Mts. Var. **ocellatum** Kell. Bulb more globular, its scales several-jointed; leaves brighter green; purple spots of flower margined with red.—Mountains from Santa Barbara to Los Angeles. Santa Rosa Isl.

Refs.—LILIUM HUMBOLDTII Roezl & Leicht.; Duch. Jour. Soc. Hort. France, ser. 2, 5:43 (1871), type from the Sierra Nevada, *Roezl*, who discovered it on the centenary of the birth of Alexander von Humboldt; Comptes Rendus, 72:558 (1871); Elwes, Monog. Lil. pl. 32 (1880). *L. canadense* var. *puberulum* Torr. Pac. R. Rep. 4:146 (1857), type loc. "between Grass Valley and Downieville," *Bigelow*. Var. BLOOMERIANUM Jepson. *L. bloomerianum* Kell. Proc. Cal. Acad. 4:160 (1872), type loc. not known. Var. OCELLATUM Kell. Proc. Cal. Acad. 5:88 (1873), type loc. Santa Rosa Isl., *Harford*.

6. **L. columbianum** Hanson. OREGON LILY. Stem slender, 2 to 4 feet high; bulb small (1½ to 2 inches in diameter); upper leaves scattered, the lower in whorls; perianth-segments 1½ to 2 inches long, strongly recurved, bright reddish orange, thickly spotted with purple.

Humboldt Co. North to Oregon and British Columbia.

Loc.—N. Humboldt Co., coast district, acc. *Tracy*.

Refs.—LILIUM COLUMBIANUM Hanson; Baker, Jour. Linn. Soc. 14:243 (1874), type from Ore., *Lobb* 350; Elwes, Monog. Lil. pl. 31 (1880). *L. canadense* var. *parviflorum* Hook. Fl. Bor. Am. 2:181 (1839), type loc. Columbia and Willamette rivers, *Douglas, Tolmie*.

7. **L. maritimum** Kell. COAST LILY. Stem 1 to 4 feet high with alternate or rarely whorled leaves; bulb rhizomatous, its scales seldom more than one-jointed; leaves very dark green, narrowly oblanceolate or linear, 1 to 5 inches long and 2 to 7 lines wide; flowers 1 to 5, dark red, funnelform, horizontal on long pedicels; segments barely dotted at base, 1¼ to 1½ inches long, the upper ⅓ somewhat recurved; stamens less than 1 inch long, exceeding the style; capsule subglobose to elliptic-oblong, 9 to 10 lines long.

Low meadows or bogs near the coast from Marin Co. northward to Ten Mile River, Mendocino Co.

Locs.—Havens Neck, *Brandt*; Pt. Arena, *Bioletti*; Noyo River, *Davy* 6569.

Refs.—LILIUM MARITIMUM Kell. Proc. Cal. Acad. 6:140 (1876), type loc. California coast near San Francisco; Elwes, Monog. Lil. pl. 12, fig. 1 (1880); Jepson, Fl. W. Mid. Cal. 110 (1901).

8. **L. occidentale** Purdy. Eureka Lily. Stem 2 feet high in open ground or 4 to 6 feet high in thickets; bulb like that of L. maritimum; leaves whorled on the middle of the stem, scattered below, lanceolate, acute; flowers from a few to 15 on strongly divaricate pedicels 3 to 9 inches long, nodding at summit; segments 1¼ to 2½ inches long, recurved for ⅔ their length, varying from dark red to reddish yellow, fading purplish, the lower part commonly orange with purple-black spots; anthers oblong, 2 lines long, dark red.

Near the ocean, northern Humboldt Co. to southern Oregon.

Locs.—Humboldt Co., *Tracy* 4356 (Patrick's Point), 5078 (Humboldt Hill), 3705 (Indianola), 4376 (Korbel); Jones Creek, Del Norte Co., *Jepson* 2894.

Ref.—Lilium occidentale Purdy, Erythea 5:103 (1897), type loc. Humboldt Bay, *Purdy*.

9. **L. parvum** Kell. Small Tiger Lily. Stem 1½ to 7 feet high; rootstock thick and fleshy, not branching, the scales 3 or 4-jointed; leaves lanceolate, 3 to 5 inches long, in whorls or quite scattered; flowers 1 or 2 to very many, small (1 to 1¼ inches long) on erect or ascending pedicels; perianth funnelform, only the tips of the segments spreading, orange-yellow spotted with purple.

Wet places along streams or edges of swamps, Sierra Nevada north to Mt. Shasta, 6000 to 9000 feet. Southern Oregon.

Locs.—Truckee, *Sonne*; Blue Lakes, Amador Co., *Hansen*; Snowdon Ranch, Calaveras Co., *Jepson*; Kennedy Mdws., upper Stanislaus River, *Jepson* 6544, 6545; Pleasant Valley, Tuolumne Co., *Jepson* 3395; Merced Big Trees, *Jepson*; Shaver Mills, Fresno Co., *K. Brandegee*.

Refs.—Lilium parvum Kell. Proc. Cal. Acad. 2:179, fig. 52 (1863); Elwes, Monog. Lil. pl. 30 (1880). *L. canadense* var. *parvum* Baker; Hook. Bot. Mag. t. 6146 (1875).

10. **L. pardalinum** Kell. Tiger Lily. Stem 3 to 5 or even 7 feet high; rootstock thick and fleshy, closely covered with 2-jointed closely overlapping scales, branching and eventually forming large mat-like clusters; leaves in whorls or alternate, linear-lanceolate; flowers 1 to many, racemose or the lower in whorls, on long spreading pedicels; segments 2 to 3 inches long, 6 to 9 lines wide, strongly revolute, bright orange-red with a lighter orange center and large purple spots on the lower half; capsule narrowly oblong, acutely angled, 1½ inches long.

Stream banks and moist hillside meadows: Coast Ranges, at low altitudes near the sea or in the high mountains; Sierra Nevada, 3000 to 4000 feet. Also called Leopard Lily. Bulb-scales sometimes 3-jointed in some forms of it. June-Aug.

Locs.—Shelley Creek, Del Norte Co., *Jepson* 2918; Quartz Valley, *Butler* 1454; Mt. Shasta, *Hall & Babcock* 4047a; Hupa, *Manning* 15; Comptche, *Jepson* 2233; Horse Mt., Lake Co., *Jepson*; Fairfax, Marin Co., *Edith A. Lee*; Santa Cruz Mts., *Jepson*; Mt. Pinos, *Hall* 6648; San Bernardino Valley, *W. G. Wright*; Alta Mdw., Sequoia Park, *Hopping* 93; Bear Valley, Nevada Co., *Jepson*; Mt. Lassen, *Hall & Babcock* 4364.

Refs.—Lilium pardalinum Kell. Proc. Cal. Acad. 2:12, pl. (1863), type from Alameda Co., *Kellogg*; Elwes, Monog. Lil. pl. 28 (1880); Jepson, Fl. W. Mid. Cal. 109 (1901). *L. californicum* Lindl., Elwes, l.c. pl. 29.

L. roezlii Regel, Gartenflora, 19:321, t. 667 (1870), type probably from California, not "Utah," *Roezl*.—Is one of many forms of L. pardalinum; perianth clear yellow with dark spots, and sometimes with clear red tips.—Occurs in the Siskiyou Mts., acc. Purdy. L. warei Purdy; Bailey, Stand. Cycl. Hort. 1878 (1916). Perianth clear rich yellow, unspotted, quite fragrant.—Said to have been found in Southern California, probably Lower California.

11. **L. parryi** Wats. Lemon Lily. Stem slender, glabrous, 2 to 5 feet high, 2 to 10-flowered; bulb like that of L. parvum, its scales numerous, thick, about 1 inch long; leaves usually scattered, sometimes the lower in a whorl, linear-oblanceolate, 4 to 6 inches long, about 1 inch wide, mostly acuminate; flowers clear lemon yellow, sparingly and minutely purple-black dotted, on stout short pedicels; perianth-segments 3 to 4 inches long, somewhat spreading above, or the tips recurved; stamens and style a little shorter; anthers oblong, brownish, 3 lines long; capsule narrowly oblong, acutish, nearly 2 inches long, 6 lines wide.

Moist situations, high mountains of Southern California. East to Arizona.

Locs.—Little Green Valley, San Bernardino Mts., *G. R. Hall* 18; Strawberry Valley, Mt. San Jacinto, *Hall* 2451; Palomar, acc. *Robt. Asher*; San Diego Co., *Gregory*.

Refs.—LILIUM PARRYI Wats. Proc. Davenport Acad. 2:188, tt. 5, 6 (1878), type loc. at head of stream running southerly into San Gorgonio Pass, *Parry;* Elwes, Monog. Lil. pl. 12, fig. 2 (1880).

21. **YUCCA** L. SPANISH BAYONET

Trees or shrubs with simple or branched stems. Leaves alternate, linear-lanceolate. Flowers large, in terminal panicles, the perianth-segments distinct, nearly equal, withering-persistent. Stamens 6. Fruit a capsule, either dry and dehiscent, or somewhat fleshy and indehiscent. Seeds numerous, in 2 rows in each cell, flat, horizontal, with thin black coat.—The flowers are incapable of self-pollination, each Yucca species being dependent upon a particular moth or species of Pronuba. The female Pronuba works by night, collecting the pollen from the anthers and rolling it into a little ball; she then flies to the flower of another plant, deposits her eggs in the ovary, and then in a manner which corresponds to actions full of purpose and deliberation climbs to the style and thrusts the pollen ball down the stigmatic tube. The larva destroys about a dozen seeds, but even if several larvae develop many perfect seeds are left.—Species about 28, North America. (An Indian name for the Manihot.)

Bibliog.—Engelmann, Geo., Notes on the Genus Yucca (Trans. St. Louis Acad. Sci. 3:17–54, 210–214,—1873). Baker, J. G., Synopsis of the Aloineae and Yuccoideae (Jour. Linn. Soc. Bot. 18:148–241,—1880). Riley, C. V., The Yucca Moth and Yucca Pollination (Rep. Mo. Bot. Gard. 3:99–158, pls. 34–43,—1892. Trelease, Wm., Detail Illustrations of Yucca (Rep. Mo. Bot. Gard. 3:159–166, pls. 1–12, 44–54,—1892; Further studies on Yuccas and their Pollination (l.c. 4:181–226, pls. 1–23,—1893); The Yucceae (l.c. 13:27–133, pls. 1–99,—1902).

Plants without evident trunk, the rosette of leaves on the ground; filaments glabrous; style slender with capitate stigma.....1. *Y. whipplei.*

Plants commonly with distinct trunk; filaments papillate; style short or none; stigmas 3, or 1 and 3-lobed.

Trunk tall, at summit branching freely; leaf-margin denticulate.....2. *Y. brevifolia.*

Trunk commonly short and simple or shortly branched; leaf-margin not serrate, fibrous-shredding.

Style ½ to 1½ lines long.....3. *Y. mohavensis.*

Style 6 to 10 lines long.....4. *Y. baccata.*

1. **Y. whipplei** Torr. QUIXOTE PLANT. Flowering stem 8 to 14 feet high, the leaves in a basal rosette; leaves narrow, 1 to 1¾ feet long; panicle 3 to 6 feet long; flowers creamy-white, 1¼ to 1½ inches long, the perianth-segments thinnish; filaments much thickened; capsule short-cylindric or subglobose, 1¼ to 2 inches long.

Chaparral belt of cismontane Southern California, north in the Coast Ranges to San Benito Co. and the Sierra Nevada as far north as Kings River. Lower California. May-June.

Biol. and Economic Note.—The mature individual produces offsets or new rosettes of leaves, in some cases only a few rosettes, yet again, especially towards the desert, a considerable number, thus becoming very caespitose. After the parent individual flowers and matures seed, it dies completely, the offsets representing individuals of a new generation. In this respect it differs entirely from our other species with woody and often branching trunks. In these species, *Y. brevifolia, Y. mohavensis* and *Y. baccata,* only the short branch which bears the panicle dies after fruit maturity.

The young flowering shoot is stripped and roasted by the native tribes who value it as a delicacy. The fibre of the leaves is manufactured into cordage.

Locs.—Pico Blanco, *Davy* 7335; Sans Mill, Santa Lucia Mts., *Jepson* 1684; se. San Benito Co., *Hall* 9943; Waltham Creek, *Jepson*; Tule River, *Jepson*; Cedar Creek, Sequoia Park, *Jepson* 589; Middle Fork Kings River below Tehipite, acc. *Hopping*; Santa Inez Mts., *Dunn*; San Bernardino, *Jepson* 5521; Thomas Valley, San Jacinto Mts., *Jepson* 1318.

Refs.—YUCCA WHIPPLEI Torr. Bot. Mex. Bound. 222 (1859), type loc. San Pasqual, *Schott*; Trel. Rep. Mo. Bot. Gard. 3:164, pls. 11, 12, 54 (1892). *Hesperoyucca whipplei* Baker, Jour. Linn. Soc. 18:230 (1880).

2. **Y. brevifolia** Engelm. JOSHUA TREE. Tree commonly 16 to 30 feet high with an open crown of arm-like branches, the columnar trunk 8 to 15 feet high and 1 to 3½ feet in diameter; bark dark brown, checked into small squarish plates; leaves 6 to 9 inches long, the margin denticulate, not shreddy; flowers greenish white, congested in a heavy panicle 8 to 14 inches long; perianth-segments very thick and fleshy, 1½ to 2 inches long; stamens ½ length of the pistil, the filaments subglobose-dilated at the recurved apex; stigmas 3, obscurely 2-lobed; capsule oblong-ovate, slightly 3-angled, 2 to 4 inches long and 1½ to 2 inches broad; seeds with ruminated endosperm.

Mesas, Mohave Desert, widely distributed and forming extensive groves, north to eastern Kern Co. and to Inyo Co. East through Nevada to Utah.

Locs.—Lancaster; Antelope Valley; Mohave; Kramer; Barstow, *Jepson* 4816; Coolgardie, *Jepson* 6631; Warrens Well; Cottonwood Mts.; New York Mts., *Jepson* 5443; Owens Lake; Kern Valley.

Refs.—YUCCA BREVIFOLIA Engelm.; Wats. Bot. King, 5:496 (1871); *Jepson*, Silva Cal. 170, pl. 54 (1910). *Y. draconis* var. *arborescens* Torr. Pac. R. Rep. 4:147 (1857), type loc. e. Mohave Desert, *Bigelow*. *Y. arborescens* Trel. Rep. Missouri Bot. Gard. 3:163, pls. 5, 49 (1892); Sarg. Silva N. Am. 10:19, t. 502 (1896); Merriam, N. Am. Fauna, 7:353 (1893), contains an extensive list of stations. *Clistoyucca arborescens* Trel. Rep. Mo. Bot. Gard. 13:41 (1902). *C. brevifolia* MacBride, Contrib. Gray Herb. n.s. 53:6 (1918).

3. **Y. mohavensis** Sarg. SPANISH DAGGER. Trunk simple or shortly branched, 3 to 7 or 15 feet high, or sometimes very short or almost none; leaves concave, light yellow-green, entire on the margin, 1¼ to 3 feet long; flowers in a panicle 1 to 1½ feet long; filaments narrowly dilated below (especially those opposite the inner segments), somewhat clavate at apex, nearly as long as the pistil; style very short; stigma 3-lobed, each lobe notched at apex; capsule cylindric, fleshy, 2½ to 4 inches long and 1 to 1½ inches thick, usually constricted about the middle; endosperm not ruminated.

Mohave Desert south through the San Jacinto and Santa Rosa mountains to northern Lower California, extending west to the San Bernardino Valley and the coast near San Diego. East into Arizona and southern Nevada.

Locs.—Calico Mts.; Ord Mt., *Jepson* 5848; Warrens Well; Cottonwood Mts.; San Gorgonio Pass, *Jepson* 6068; Palm Cañon, Mt. San Jacinto, *Jepson* 1411a; San Timoteo Cañon, *Hall* 5751; Santa Rosa Mt., *Hall* 1905; San Felipe Valley, *Jepson*.

Refs.—YUCCA MOHAVENSIS Sarg. Gard. & For. 9:104 (1896), type loc. Mohave Desert, *Sargent*, Silva N. Am. 10:15, t. 500 (1896); Jepson, Silva Cal. 171 (1910). *Y. baccata* Engelm. Trans. St. Louis Acad. 3:44 (1873), in part; Wats. Bot. Cal. 2:164 (1880), in part; Parish, Gard. & For. 4:136 (1891). *Y. macrocarpa* Cov. Contrib. U. S. Nat. Herb. 4:202 (1893).

4. **Y. baccata** Torr. SPANISH BAYONET. Very similar to Y. mohavensis; leaf rosettes yellow-green, on the ground, rarely rising above it; leaves 1¼ to 2 feet long; flowering stem 2 to 3¼ feet high; flowers (2½ or) 3 to 4 inches long; base of filaments forming fleshy papillae; style much elongated; fruit conical.

Eastern Mohave Desert. East to Colorado and New Mexico.

Locs.—Providence Mts., *T. Brandegee*; New York Mts., *Parish* 10281.

Refs.—YUCCA BACCATA Torr. Bot. Mex. Bound. 221 (1859), type loc. Parras, Coahuila, Mex., *Thurber*; Trel. Rep. Mo. Bot. Gard. 13:109, pls. 68, 69 (1902).

22. NOLINA Michx.

Perennials with linear rigid leaves crowded in a rosette at the ground. Flowering stem stout, naked. Flowers polygamo-dioecious, much congested in a compound panicle; pedicels jointed near the base. Perianth whitish, persistent, its segments 6, distinct, elliptic to lanceolate. Stamens 6; filaments very short. Ovary deeply 3-lobed; ovules 2 in each cell, basal; style very short; stigmas 3, short, recurved. Capsule broadly 3-winged, membranous, tardily dehiscent, loculicidal or bursting irregularly; seeds often solitary.—Species 24, southern United States and Mexico. (P. C. Nolin, French agricultural essayist, middle of the eighteenth century.)

Fig. 58. NOLINA PARRYI Wats. On wagon trail to Coyote Cañon from Vandeventer Flat, Santa Rosa Mts. (Jepson, photo.)

Mature leaves serrulate; style present.....1. *N. parryi.*
Mature leaves not serrulate; style none.....2. *N. bigelovii.*

1. **N. parryi** Wats. (Fig. 58.) Stem 3 to 6 feet high; leaves rather thick, concave, keeled, serrulate, ¾ to 1¼ inches wide, 2 to 3⅓ feet long; bracts irregularly and remotely salient-laciniate; flowers 3 lines long; capsule orbicular in outline, notched at both ends, 6 to 7 lines broad.

Arid mountain slopes, 4000 to 6000 feet: eastern San Bernardino Mts., south through the San Jacinto Mts. to San Diego Co. Arizona; Lower California. May-June.

Locs.—Rattlesnake Cañon, e. San Bernardino Mts., *Parish* 3145; Tahquitz Valley, *Hall* 2432; Santa Rosa Mt., *Jepson* 1433; Corona, acc. Parish; Pala, *Orcutt*; San Felipe, *T. Brandegee.*

Ref.—NOLINA PARRYI Wats. Proc. Am. Acad. 14:247 (1879), type loc. desert east of San Bernardino, *Parry.*

2. **N. bigelovii** Wats. Leaves scarcely concave or keeled, the margin shredding away in brown fibres; margins of bracts deeply and rather closely fringed; perianth 1 to 1½ lines long.

Mountains, southern borders of the Colorado Desert; south into Lower California, east into Arizona.

Loc.—Mountain Sprs., San Diego Co., *Parish* 9044, only known station in California.

Refs.—NOLINA BIGELOVII Wats. Proc. Am. Acad. 14:247 (1879). *Dasylirion bigelovii* Torr. Pac. R. Rep. 4:151 (1857), type loc. Williams River, Ariz., *Bigelow.*

23. **ASPARAGUS** L.

Stem from a rootstock, very much branched and with filiform branchlets clustered in the axils of the scaly leaves. Flowers small, solitary or in umbels or racemes. Perianth-segments alike, distinct or slightly united, the stamens inserted on their bases. Ovary 3-celled, with 2 ovules in each cell; style short, stigmas 3, recurved. Fruit a globose berry.—Species 100, Old World. (Ancient Greek name.)

1. **A. officinalis** L. ASPARAGUS. Stems tall and branching, 3 to 5 feet high, when young stout, succulent and edible; clustered branchlets 4 to 8 lines long; flowers green, pendulous on jointed peduncles; perianth campanulate, 3 lines long, with included stamens; berry red, 4 lines in diameter.

Garden plant escaped to low lands about Alameda, San Bernardino and Los Angeles.

Ref.—ASPARAGUS OFFICINALIS L. Sp. Pl. 1:313 (1753), type European.

24. **STREPTOPUS** Michx. TWISTED-STALK

Stems branching from a creeping rootstock. Leaves alternate, ovate, sessile or clasping, taper-pointed, membranous. Flowers greenish-white, axillary, solitary or in pairs, drooping on slender filiform peduncles which are bent or contorted at the middle. Perianth campanulate, the lanceolate segments distinct, recurved-spreading, deciduous. Stamens 6; filaments short, flattened. Style 1; stigma slightly 3-lobed. Fruit a red ovoid or oval berry.—Five species, North America, Europe and Asia. (Greek streptos, twisted, and pous, foot or stalk.)

1. **S. amplexifolius** DC. LIVER-BERRY. Stem 1¼ to 3 feet high; leaves ovate, clasping, glaucous beneath, 2½ to 4¾ inches long; peduncles with a gland at the knee; flowers greenish-white, 5 to 6 lines long.

Margin of cold streamlets in the woods: Mendocino Co. to western Siskiyou Co., thence east and southeast to Modoc and Plumas cos., 1000 to 5500 feet. North to Alaska and east to the Atlantic. Europe, Asia.

Locs.—Dinsmore Ranch, Van Duzen River, *Tracy* 3956; Trinity Summit, *Jepson* 2058a; Marble Valley, w. Siskiyou Co., *Butler* 97; Sisson, *Jepson*; Forestdale, *M. S. Baker*; Mill Creek, Plumas Co., *R. M. Austin.*

Refs.—Streptopus amplexifolius DC. Fl. Fr. 3:174 (1805). *Uvularia amplexifolia* L. Sp. Pl. 1:304 (1753), type European.

25. **DISPORUM** Salisb.

Stem erect, branched above, leafy, arising from a short horizontal rootstock. Leaves ovate, sessile, thin, netted-veined. Flowers greenish or white, drooping on a terminal peduncle, solitary, or few in an umbel. Perianth campanulate, deciduous. Filaments filiform, attached within the anthers, above the base. Fruit a berry.—Species about 13, North America and Asia. (Greek dis, double, and spora, seed, some species with 2 ovules in each cell.)

Flowers greenish, ½ inch long or nearly; style glabrous, entire.
Leaves 1½ to 3 inches long.
Stamens equalling or exceeding the perianth; anthers not hispid; leaves mostly cordate at base.....1. *D. hookeri.*
Stamens generally slightly shorter than the perianth; anthers minutely hispid; upper leaves slightly cordate at base.....2. *D. trachyandrum.*
Leaves 1 to 1½ inches long; stamens ½ the length of perianth, anthers nearly sessile.....3. *D. parvifolium.*
Flowers whitish, ¾ to 1 inch long; leaves 2 to 4 inches long; style densely short hairy, slightly 3-cleft at apex; leaves sub-cordate or rounded at base.....4. *D. smithii.*

1. **D. hookeri** Britton. Fairy Bells. One to 2¼ feet high, roughish puberulent; leaves ovate, cordate at base, abruptly acute or attenuate, 1½ to 3 inches long, the uppermost somewhat oblique; perianth green, narrowly campanulate, 5 to 6 lines long, the tips of the segments spreading; stamens equaling or exceeding the perianth; berry obovoid to subglobose, obtuse, scarlet.

Shady woods back of the immediate coast, Coast Ranges from Santa Cruz Co. to Siskiyou Co.

Locs.—Berkeley, *Jepson* 8418; Franz Valley grade from Calistoga, *Jepson*; Hood's Peak Range, *Jepson*; Noyo River, *Charlotte Hoak*; Russian Creek, w. Siskiyou Co., *Butler* 93.

Refs.—Disporum hookeri Britton, Bull. Torr. Club 15:188 (1888); Jepson, Fl. W. Mid. Cal. 127 (1901). *Prosartes hookeri* Torr. Pac. R. Rep. 4:144 (1857), type loc. Oakland Hills, *Bigelow*. Var. *oblongifolia* Wats. Bot. Cal. 2:179 (1880).

2. **D. trachyandrum** Britt. Stem 1 to 2 feet high, purplish and nearly glabrous below, pubescent above; leaves ovate to oblong-ovate, abruptly acute to acuminate, sessile, upper ones very slightly cordate at base, 1 to 2½ inches long; flowers greenish, campanulate with spreading segment tips, nearly ½ inch long, on short drooping pedicels, solitary or in 2s or 3s; stamens slightly shorter than the perianth; anthers minutely hispid; ovary glabrous; style entire; berry obovate, scarlet.

In the Sierra Nevada, Tuolumne Co. to Siskiyou Co. Southern Oregon.

Locs.—Snow Creek, Fresno Co., *A. L. Grant* 1057; Hetch-Hetchy, *A. L. Grant* 987; Calaveras Big Trees, *A. L. Grant*; Siskiyou Co., *Butler* 787 (Humbug Mt.).

Refs.—Disporum trachyandrum Britton, Bull. Torr. Bot. Club 15:188 (1888). *Prosartes trachyandra* Torr. Pac. R. Rep. 4:144 (1857), type loc. Duffield's Ranch, near Confidence, Tuolumne Co., *Bigelow*.

3. **D. parvifolium** Britt. Rather stout, much branched, woolly-pubescent; leaves ovate to broadly lanceolate, the lower cordate and clasping, 1 to 1½ inches long, acuminate; flowers rather numerous, 4 lines long; segments slightly spreading, twice longer than the lanceolate acute nearly sessile anthers; ovary very small, slightly pubescent; style slightly exserted.

Siskiyou Mts. We have seen no authentic spms. Two spms. from Siskiyou Co. (Quartz Valley, *Butler* 690, and Kidder Creek, *Butler* 1222) have small rather dark green leaves and numerous flowers with a small ovary (glabrous or essentially so), but the stamens are more or less exserted with filaments twice the length of the anthers.

Refs.—Disporum parvifolium Britton, Bull. Torr. Bot. Club 15:188 (1888). *Prosartes parvifolia* Wats. Bot. Cal. 2:179 (1880), type loc. Siskiyou Mts., *Rattan* (in fl., June, 1879).

4. **D. smithii** Piper. Fairy Lantern. One to 3 feet high, soft-pubescent or almost glabrous; leaves round-ovate to ovate-lanceolate, rounded or subcordate (and often a little oblique) at base, at apex abruptly acute or attenuate, 2 to 4¾ inches long; perianth whitish, broad and cup-shaped at base, ¾ to 1 inch long, the tips of the segments erect; stamens ⅓ shorter than the perianth; berry yellow, oblong-obovate, attenuate above into a short beak.

Stream banks, Coast Range woods very near the coast: San Mateo Co. to Del Norte Co. North to British Columbia. Apr.

Locs.—Muir Woods, *A. L. Grant*; Inverness, *Jepson* 1716; Noyo River, *Charlotte Hoak*; Westport, *Jepson*; Del Norte Co., *Goddard*.

Refs.—Disporum smithii Piper, Contrib. U. S. Nat. Herb. 11:201 (1906). *Uvularia smithii* Hook. Fl. Bor. Am. 2:174, t. 189 (1839), type loc. Nootka Sound, *Menzies*. *Prosartes menziesii* Don, Trans. Linn. Soc. 1:48 (1839). *Disporum menziesii* Britton, Bull. Torr. Club, 15:188 (1888); Jepson, Fl. W. Mid. Cal. 127 (1901).

26. **SMILACINA** Desf.

Stem simple and leafy, from a horizontal rootstock, bearing a terminal raceme or panicle of small white flowers with minute bracts. Leaves sessile, many-nerved. Pedicels jointed at the summit. Perianth persistent, the segments distinct and spreading. Stamens inserted at the base of the segments; anthers versatile. Style 3-lobed at the summit, persistent; ovules 2 in each cell. Fruit a globose 1 to 3-seeded berry. Seeds sub-globose, with thin testa and horny endosperm.—Species about 20, North America and Asia. (Diminutive of smilax.)

Flowers in a simple raceme; stamens shorter than the perianth-segments; filaments not dilated.
Leaves spirally arranged, often folded.....1. *S. stellata.*
Leaves mostly 2-ranked, commonly flat.....2. *S. sessilifolia.*
Flowers in a panicle; stamens much longer than the perianth-segments; filaments dilated.....
3. *S. amplexicaulis.*

1. **S. stellata** Desf. Star-flower. Stem ¾ to 2 feet high; rootstock stout; herbage pale; leaves oblong-lanceolate to lanceolate, acuminate, often somewhat folded on the midrib, sessile and clasping, 3 to 5½ inches long; raceme open, 6 to 20-flowered; pedicels 2 to 6 lines long; perianth-segments 2 to 3½ lines long; stamens ⅔ as long as the perianth-segments; style nearly equaling the ovary; berry at first with 6 dark-brown longitudinal stripes or bands on a greenish or whitish ground, eventually black.

Crests and east side of the Sierra Nevada; desert ranges of Mono and Inyo cos., south to Southern California, and east to the Atlantic.

Locs.—Fandango Valley, Warner Mts., *L. S. Smith* 931; Jess Valley, Modoc Co., *Jepson* 7941; Long Valley, Lassen Co., *Jepson* 7783; Kennedy Mdws., upper Stanislaus River, *Jepson* 6541; Sonora Peak, *A. L. Grant* 393; Silver Cañon, White Mts., *Jepson* 7203; Burdick, Owens Valley, *Almeda Nordyke*; San Gabriel Mts., *Peirson* 1682.

Refs.—Smilacina stellata Desf. Ann. Mus. Par. 9:52 (1807). *Convallaria stellata* L. Sp. Pl. 1:316 (1753), type from Canada; Sims, Bot. Mag. t. 1043 (1807).

2. **S. sessilifolia** Nutt. Slim Solomon. Similar to S. stellata and perhaps only a variety of it; rootstock slender; herbage bright green; upper part of stem commonly somewhat arcuately curving and the flat leaves disposed to be 2-ranked; leaves oblong-ovate to lanceolate; raceme commonly 3 to 9-flowered; stamens ½ to ¾ as long as the perianth-segments; berry red, 1 to 4-seeded, 3 to 5 lines broad.

Common in shady woods and on moist brushy slopes: Coast Ranges, mostly near the coast; Sierra Nevada. North to Washington.

Locs.—Independence Lake, *Platt*; Yosemite, *Muir*; Natural Bridge, Tulare Co., *Culbertson* 4362; Big Creek, Santa Lucia Mts., *Marion Parsons*; San Juan, San Benito Co., *Brewer*

725; Loma Prieta, *Davy* 630; Los Gatos, *Heller* 7348; San Andreas Lake, San Mateo Co., *C. F. Baker* 1915; Berkeley Hills, *Jepson*; Mt. Tamalpais, *Jepson*; Inverness, *Jepson* 557a; Sonoma Geysers, *F. P. McLean;* Ft. Bragg, *W. C. Mathews* 87; Humboldt Hill, *Tracy* 1057; Trinity Summit, *Jepson* 2115.

Refs.—SMILACINA SESSILIFOLIA Nutt.; Baker, Jour. Linn. Soc. 14:566 (1875), based on material from British Columbia to California and New Mexico; Jepson, Fl. W. Mid. Cal. 126 (1901). *Unifolium sessilifolium* Greene, Bull. Torr. Club, 15:287 (1888). *Vagnera sessilifolia* Greene, Man. Bay Reg. 316 (1894). *Unifolium liliaceum* Greene, Pitt. 1:280 (1889), type loc. Siskiyou Co., *Greene* (Pitt. 2:31).

3. **S. amplexicaulis** Nutt. FAT SOLOMON. Stem 1 to 3 feet high, this and the under surface of the leaves with a minute fuzzy pubescence or rarely glabrous; rootstock stout, elongated; leaves oblong-ovate to lanceolate, 3 to 5½ inches long, acute at apex, sessile by a broad clasping base; panicle usually short-peduncled, oblong, 2 to 4 inches long; pedicels 1 line long or less; perianth-segments less than 1 line long; filaments lanceolate or broadly subulate, much longer and often broader than the segments; style ½ to nearly as long as the ovary; berry light red, finely sprinkled with dark red dots, 2 to 2½ lines in diameter, usually 1-seeded.

Shady woods, Sierra Nevada and Coast Ranges. North to British Columbia.

Locs.—North Fork Bidwell Creek, Modoc Co., *Jepson* 7901; Long Lake, Plumas Co., *Hall* 9320; Independence Lake, Nevada Co., *Platt*; Heather Lake, El Dorado Co., *Jepson* 8164; Armstrong's Sta., Amador Co., *Hansen* 1076; Calaveras Big Trees, *A. L. Grant*; Sonora Pass, *A. L. Grant* 154; Blue Cañon, Placer Co., *Harriet Walker* 1226; Huntington Lake, Fresno Co., *A. L. Grant* 1044; S. Fork Kaweah River, *Culbertson* 4252; Greenhorn Range, Kern Co., *Hall & Babcock* 5056; Deer Springs, San Jacinto Mts., *Hall* 2572; Notleys Ldg., Santa Lucia Mts., *Marion Parsons*; Saratoga, Santa Cruz Mts., *Jepson* 5630; Palo Alto, *Tidestrom*; Mt. Tamalpais, *Jepson*; Comptche, *Jepson* 2169; Redwood Creek, n. Humboldt Co., *Jepson* 1950; Russian Creek, Siskiyou Co., *Butler* 94; Mt. Shasta, *Setchell & Dobie.*

Var. **glabra** McBr. Leaves broadly oblong; herbage glabrous and slightly glaucous.—High altitudes, Humboldt Co. and Sierra Nevada.

Locs.—Trinity Summit, *Jepson* 2114; Matterhorn Cañon, Yosemite Park, *Jepson* 4502.

Refs.—SMILACINA AMPLEXICAULIS Nutt. Jour. Acad. Phila. 7:58 (1834), type loc. sources of the Columbia River, *Wyeth*; Jepson, Fl. W. Mid. Cal. 127 (1901). *S. racemosa* var. *amplexicaulis* Wats. Bot. King, 345 (1871); Henderson, Bull. Torr. Club, 27:357 (1900). *Unifolium amplexicaule* Greene, Bull. Torr. Club 15:287 (1888). *Vagnera amplexicaulis* Greene, Man. Bay Reg. 316 (1894). *V. pallescens* Greene, Proc. Acad. Phila. 47:551 (1895), type loc. Fresno Co. (middle elevations of the Sierra Nevada); pale glaucous-green but not glabrous; panicle 4 to 6 in. long (ex. char.). Var. GLABRA McBr. Contrib. Gray Herb. 56:18 (1918), type loc. South Fork Kaweah River, *Culbertson* 4252. *S. glabra* Tracy in herb.

27. **MAIANTHEMUM** Webb.

Stem low, from a horizontal rootstock, bearing 2 or 3 broad leaves and a terminal raceme of white flowers, the pedicels solitary or 2 or 3 in a cluster. Perianth-segments 4. Stamens 4, with filiform filaments. Ovary 2-celled; stigma 2-lobed. Fruit a globose red berry.—Species 2, northern hemisphere. (Greek maios, May, and anthemon, flower, in allusion to the flowering period.)

1. **M. bifolium** DC. var. **kamtschaticum** Jepson. Stem simple, erect, 4 to 14 inches high, often stout; leaves ovate- or triangular-cordate, 2 to 4½ inches long, the petiole of the lower one sometimes longer than the blade; basal leaf cordate, short-pointed, very large, very long-petioled, almost as tall as the flowering stem; raceme peduncled, ½ to 2 inches long; perianth-segments oblong or broadest toward apex, slightly unequal, 1 to 1½ lines long, becoming deflexed; berry 3 lines in diameter.

Woods of the North Coast Ranges near the coast from Marin Co. to Humboldt Co. Far north to Alaska. Asia.

Locs.—Sausalito, acc. Behr; Inverness, *Jepson* 8299; Mendocino City, *Bolander* 4777; Ft. Bragg, *W. C. Mathews*; Eureka, *Tracy* 2552.

Refs.—MAIANTHEMUM BIFOLIUM DC. var. KAMTSCHATICUM Jepson, Fl. W. Mid. Cal. ed. 2, 109 (1911). *Convallaria bifolia* var. *kamtschatica* Gmel. Linnaea 6:587 (1831), type loc.

Kamtchatca. *Maianthemum bifolium* DC. var. *dilatatum* Wood, Proc. Acad. Phila. 20:174 (1868). *Unifolium dilatatum* Howell, Fl. N.W. Am. 657 (1902). *U. bifolium* var. *kamtschaticum* Piper, Contrib. U. S. Nat. Herb. 11:200 (1906).

28. **CLINTONIA** Raf.

Stem from a creeping rootstock and bearing at or from beneath the ground a few broad leaves and a scape-like peduncle. Flowers few to many in a terminal umbel or with 1 to several small supplementary clusters scattered along the peduncle. Perianth resembling a very small lily flower, campanulate, of 6 distinct deciduous segments. Stamens 6, with filiform filaments, inserted on the base of the segments; anthers fixed just above the base, extrorse. Ovary 2 or 3-celled; ovules 2 or 3 in each cell; style slender, slightly 2 or 3-lobed, deciduous. Fruit a smooth ovoid (in ours blue) berry.—Six species, North America and Asia. (De Witt Clinton, 1769–1828, naturalist, several times governor of New York.)

Peduncles much exceeding the leaves; flowers in an umbel.....1. *C. andrewsiana.*
Peduncles shorter than the leaves; flowers solitary.....2. *C. uniflora.*

1. **C. andrewsiana** Torr. Leaves commonly 5, sometimes 6, narrowly or broadly elliptic, rather abruptly short-pointed, 7 to 13 inches long, 2 to 4½ inches broad; peduncle 15 to 20 inches high, bearing a terminal umbel of many flowers and with 2 to 4 supplementary clusters borne laterally, the lateral clusters 1 to 9-flowered or rarely none; flowers 5 to 8 lines long, rose-red or pink; filaments slightly pubescent below the middle.

Shady woods near the coast: Monterey Co. north to Humboldt Co. The berries suggest small-sized old-fashioned bluing balls.

Locs.—Santa Lucia Mts., *Vortriede;* Carmel Highlands acc. *Anson Blake*; Redwood Peak, acc. *Docia Patchett;* Bolinas Ridge, *Chesnut & Drew;* Redwood Cañon, Marin Co., *Tidestrom;* Duncan Mills, *M. S. Baker*; Ft. Bragg, *W. C. Mathews* 31; Westport, Mendocino Co., *Jepson*; Pepperwood, *Jepson*; between Ryan's Slough and Freshwater Creek, *Tracy* 4473.

Refs.—CLINTONIA ANDREWSIANA Torr. Pac. R. Rep. 4:150 (1857), type loc. Mt. Tamalpais, *Bigelow*; Jepson, Fl. W. Mid. Cal. 125 (1901).

2. **C. uniflora** Kunth. BRIDE'S BONNET. Leaves 2 or 3, oblong to narrowly elliptic, 4 to 6 inches long, including the short petiole-like base, and ¾ to 2 inches wide, acute; peduncle 1-flowered, shorter than the leaves, commonly with 1 or 2 small bracts; flowers white, 9 to 11 lines long; perianth-segments 6 to 8-nerved, much longer than the stamens.

Coniferous forests, Sierra Nevada, 3500 to 6000 feet, at scattered stations from Tulare Co. north to Lassen Co.; thence westerly to Siskiyou and Humboldt cos. North to British Columbia.

Locs.—Marble Fork, Kaweah River, *Hopping*; Merced Grove, *Jepson*; Calaveras Big Trees, *Brewer* 2095; Quincy, *R. M. Austin*; Wooley Creek, w. Siskiyou Co., *Butler* 98; Union Creek, Salmon Mts., *Hall* 8564; Trinity Summit, *P. E. Goddard*; Buck Mt., Humboldt Co., *Tracy* 2733.

Refs.—CLINTONIA UNIFLORA Kunth, Enum. Pl. 5:159 (1850). *Smilacina borealis* var. *uniflora* Schult.; Roem. & Schult. Syst. 7:307 (1829), type from the North-west Coast, *Menzies. S. uniflora* Menzies; Hook. Fl. Bor. Am. 2:175, t. 99 (1839).

29. **SCOLIOPUS** Torr.

Stem very short, subterranean, bearing a pair of broad leaves and an umbel of greenish purple flowers, the peduncle almost obsolete, the sharply angular pedicels (which look like scapes) alone appearing above ground. Perianth-segments narrow. Stamens 3, opposite the sepals, short, with greenish extrorse anthers. Ovary triquetrous, 1-celled; style short, its 3 long branches abruptly spreading horizontally, often recurving at tip. Capsule with a membranous wall which bursts irregularly.—Species 2, California and Oregon. (Greek skolios, crooked, and pous, foot, in allusion to the tortuous pedicels.)

1. **S. bigelovii** Torr. SLINK-POD. Leaves usually 2 (rarely 3), elliptic to oblong, acute, commonly mottled with dark splotches, 4 to 9 inches long, sheathing at base; flowers with a fetid odor and having something the appearance of orchids; pedicels 4 to 9 inches long, 3-angled, slightly winged, erect in flower, in fruit tortuous recurving or procumbent, the maturing capsule more or less hidden by forest litter; sepals ovate-lanceolate, 7 to 9 lines long, with 10 or 12 black veins, somewhat carinate toward the base, the upper ⅗ abruptly spreading or recurved; petals linear-subulate, as long as the sepals, hardly 1 line wide, ascending at base and with their long points convergent, forming an arch above the pistil; stamens 2½ to 3 lines long.

Deep cold shades of the Redwood forest, Santa Cruz Co. to Humboldt Co. North to southwestern Oregon. Jan.-Mar. Called "Brownies" in Humboldt Co.

Locs.—Felton, *Sonne*; Kings Mt., *C. F. Baker* 322; Hillsboro, *Inez Smith*; Mill Valley, *Jepson*; Guerneville, *M. S. Baker*; Pepperwood, *Jepson*; Dinsmore Ranch, Van Duzen River, *Tracy* 4017.

Refs.—SCOLIOPUS BIGELOVII Torr. Pac. R. Rep. 4:145, t. 22 (1857), type loc. Mt. Tamalpais, *Bigelow*; K. Brandegee, Zoe, 2:79 (1891); Jepson, Fl. W. Mid. Cal. 124 (1901).

30. TRILLIUM L. WAKE ROBIN

Stem simple, from a tuberous rootstock, naked below and bearing at the summit a whorl of 3 round-ovate netted-veined leaves and a single large flower. Perianth of 3 lanceolate herbaceous persistent sepals and 3 larger colored petals. Stamens 6, much shorter than the segments; anthers linear, on short filaments, adnate. Ovary 3 to 6-angled, 3-celled or 1-celled at summit. Styles 3, elongated, stigmatic down the inside. Fruit a fleshy reddish capsule. Seeds ovate.—About 17 species, North America and Asia. (Latin triplum, triple, on account of the 3-merous flowers.)

Bibliog.—Gleason, H. A., Pedunculate Species of Trillium (Bull. Torr. Club, 33:387-396,—1906). Goodspeed and Brandt, Notes on the Californian Species of Trillium (Univ. Cal. Publ. Bot. 7:1-88, pls. 1-17,—1916-1917). Gates, R. R., Systematic Study of the N. Am. genus Trillium, its variability and its relation to Paris and Medeola (Ann. Mo. Bot. Gard. 4:43-92, pls. 6-8,—1917).

Flower sessile; leaves sessile.....1. *T. sessile.*

Flower raised on a pedunele.
Leaves sessile or nearly so; peduncle erect.....2. *T. ovatum.*
Leaves petioled; peduncle usually declined.....3. *T. rivale.*

1. **T. sessile** L. var. **giganteum** H. & A. COMMON TRILLIUM. Stem stout, sometimes more than one from the same root, 1 to 1¾ feet high; leaves round-ovate, 2½ to 5 inches long, commonly broader than long; petals obovate to oblanceolate, 1½ to 3 inches long, deep red or lilac, or varying to dull white; capsule long-oval to subglobose, obscurely 6-angled above, circumscissile around the platform-like base.

Brushy or wooded hill-slopes or cañons: Coast Ranges from Monterey Co. north to Siskiyou Co., but not in inner Coast Range. North to Washington. The Californian plant is larger in all its parts than the Eastern plant (the type of T. sessile), but even this difference is not a constant one (*T. H. Goodspeed*). Feb.-Mar.

Locs.—Los Buellis hills, Santa Clara Co., *R. J. Smith*; Los Gatos, *Heller* 7254; Colma, *Michener & Bioletti*; Oakland Hills, *Jepson* 3107-3110; Howell Mt., *Jepson*; Lake Co., *Michener*; Yreka, *Greene.*

Var. **chloropetalum** Torr. Petals yellowish or greenish-yellow.—Monterey Co. to Siskiyou Co. and south in the northern Sierra Nevada to Placer Co. The form with pure white petals (Rock Lily) is found from Napa Valley to Humboldt Co.

Locs.—Mill Creek Cañon, Santa Lucia Mts., *Marion Parsons*; Crystal Springs Lake, San Mateo Co., *C. F. Baker* 431; Mt. Tamalpais, *Greene*; Olema, *Davy*; Clear Creek, Shasta Co., *Goldsmith*; Humbug, Siskiyou Co., *Butler* 669. Pure white flowers: St. Helena; Mendocino City; Buck Mt., Humboldt Co., *Tracy* 4181.

Var. **angustipetalum** Torr. Leaves 3 to 7 inches long; petals narrowly linear, typically 1 to 3 (rarely 5) lines wide.—Sierra Nevada; San Luis Obispo Co.

Locs.—Sierra Nevada: Pine Ridge, Fresno Co., *Hall & Chandler* 175; Hetch-Hetchy, *A. L. Grant* 986; Columbia, *A. L. Grant* 671; Strawberry, Tuolumne Co., *Jepson* 6501; Calaveras Big Trees, *A. L. Grant*. From Placer Co. north our spms. vary towards var. giganteum, having broader petals (6 to 7 lines wide): Applegate, Placer Co., *Abigail Smith;* N. Fork Butte Creek, Shasta Co., *Hall & Babcock* 4285. San Luis Obispo Co.: Arroyo Grande, *Brewer* 438; Santa Margarita, *N. K. Berg*.

Refs.—TRILLIUM SESSILE L. var. GIGANTEUM H. & A. Bot. Beech. 402 (1841), type from Cal., *Douglas*, the usual purple-flowered form; Jepson, Fl. W. Mid. Cal. ed. 2, 107 (1910). *T. giganteum* Heller, Bull. S. Cal. Acad. 2:67 (1903). Var. CHLOROPETALUM Torr. Pac. R. Rep. 4:151 (1857), type loc. redwoods, Marin Co., *Bigelow*. *T. chloropetalum* Howell, Fl. N.W. Am. 661 (1902). *T. giganteum* var. *chloropetalum* Gates, Ann. Mo. Bot. Gard. 4:50 (1917). *T. sessile* var. *californicum* Wats. Proc. Am. Acad. 14:273 (1879). Var. ANGUSTIPETALUM Torr. Pac. R. Rep. 4:151 (1857), type loc. Calaveras Big Trees, *Bigelow*. *T. giganteum* var. *angustipetalum* Gates, l.c. 51.

2. **T. ovatum** Pursh. COAST TRILLIUM. Stem 8 to 10 inches high; leaves ovate to round, sometimes disposed to be rhombic, abruptly acute, 2½ to 5½ inches long; petals oblong-lanceolate to ovate, 1 to 1½ inches long, white changing to deep rose-color; ovary incompletely partitioned above the middle; capsule broadly ovate, the angles projected into narrow wings.

Wooded cañons near the coast from Monterey Co. to Del Norte Co., thence east to Siskiyou and Shasta cos. North to British Columbia and Idaho. Mar.-Apr.

Locs.—Lucia, *K. Brandegee*; Felton, *Sonne*; San Leandro Creek, Oakland Hills, *H. H. Haworth*; Mill Valley, *A. L. Grant*; Olema, *Jepson*; Guerneville, *M. S. Baker*; Comptche, *H. A. Walker* 300; Sherwood, *Blasdale*; Hydesville, *Tracy* 4019; Crescent City, *Goddard*; Yreka, *Greene*; McCloud River, *Hall & Babcock* 4134.

Refs.—TRILLIUM OVATUM Pursh, Fl. 1:245 (1814), type loc. Cascades, Columbia River, *Lewis*; Jepson, Fl. W. Mid. Cal. 125 (1901).

3. **T. rivale** Wats. Stem slender, 4 to 10 inches high; leaves ovate, truncatish to cordate at base, 1½ to 3 inches long; flower on a peduncle 1 to 3¾ inches long; petals white, dotted with purple at the center, about 1 inch long; capsule scarcely angled.

Rocky banks, Del Norte and Siskiyou cos. North to southern Oregon.

Locs.—Gasquet, *Eastwood*. Josephine Co., Ore. (Waldo, *Howell*; Kirby, *M. S. Baker*).

Ref.—TRILLIUM RIVALE Wats. Proc. Am. Acad. 20:378 (1885), type loc. Big Flat, S. Fork Smith River, Del Norte Co., *Shockley*.

31. **SMILAX** L. GREENBRIER

Stems prickly or smooth, climbing by means of tendrils, arising from a tuberous rootstock. Leaves alternate, netted-veined, the petioles bearing near the base a pair of tendrils. Flowers small, greenish, dioecious, borne in axillary umbels. Perianth-segments distinct. Staminate flower with 6 stamens. Pistillate flower usually with 1 to 6 abortive stamens; ovary with 1 or 2 ovules in each cell; style short or none; stigmas 1 or 3. Fruit a berry.—Species 195, mostly in tropical regions. (Smilax, a Greek name.)

1. **S. californica** Gray. Stem woody, climbing over shrubs and trees or trailing over the ground, 3 to 6 (or 14) feet long; leaves ovate, sub-cordate, 2 to 4¾ inches long, on petioles ½ inch long; perianth 5 lines long, its segments 6; berries globose, black, 4 lines in diameter.

Butte Co. to Siskiyou Co., thence south to Trinity Co. North to southern Oregon.

Locs.—Big Chico, *R. M. Austin*; Dana, Shasta Co., *Hall & Babcock*; Sims, *Jepson*; Dunsmuir, *Jepson* 6173; Sisson, *Jepson;* Quartz Valley, *Butler* 1466; Wooley Creek, w. Siskiyou Co., *Butler* 146; Deadwood, *Blasdale*; Hy-am-pum, *Chesnut & Drew*.

Refs.—SMILAX CALIFORNICA Gray, Bot. Cal. 2:186 (1880). *S. rotundifolia* var. *californica* A. DC. Monog. Phaner. 1:75 (1878), type loc. east side of the upper Sacramento Valley, *Hartweg* 342.

AMARYLLIDACEAE. Amaryllis Family

Perennial herbs with basal leaves. Flowers perfect, regular, the inflorescence borne on a scape-like stem. Perianth 6-parted, the 6 stamens inserted on its tube. Ovary inferior, 3-celled; style 1. Fruit a several to many-seeded capsule.—Species about 850 in 71 genera; all continents but chiefly tropical or subtropical. Amaryllis, Narcissus, and Hypoxis species are extensively cultivated in California gardens.

Bibliog.—Engelmann, Geo., Notes on Agave (Trans. Acad. Sci. St. Louis, 3:291–322,—1875); Flowering of Agave shawii (l.c. 579–582, pl. 4,—1877). Baker, J. G., Handbook of the Amaryllideae (1888). Mulford, Isabel, Agaves of the U. S. (Rep. Mo. Bot. Gard. 7:47–100, pls. 26–63,—1896). Trelease, Wm., Agaves of Lower Cal. (Rep. Mo. Bot. Gard. 22:37–65, pls. 19–72,—1911). Berger, A., Die Agaven (pp. 1–288, figs. 1–79,—1915).

1. AGAVE L. Maguey

Perennial herbs with a basal rosette of leaves on a short or mostly subterranean trunk. Leaves in ours evergreen, fleshy, spine-tipped and margined by prickles. Flowering stem tall, arising from the center of the rosette. Flowers thick and fleshy. Stamens exserted.—Species about 250, South and North America, chiefly Mexico. *A. americana* L., Century Plant, is common in California gardens; in Mexico, just before flowering, a plant of this species yields for a long time one or two gallons a day of saccharine juice from which pulque, the national drink of Mexico, is made. *A. rigida* var. *sisalana* Engelm., of Mexico, yields Sisal Hemp.

Flowers about 4 in a cluster, the clusters racemosely or subspicately arranged along the terminal axis; stamens inserted at the middle of the perianth-tube.....1. *A. utahensis.*

Flowers many in terminal bunches on the branches of a panicle.
Trunk subterranean or essentially so; stamens inserted at the mouth of the tube.
Ovary fusiform, about twice as long as the perianth-segments.....2. *A. consociata.*
Ovary flask-shaped, longer than the perianth-segments.....3. *A. deserti.*
Trunk rising above the ground; stamens inserted at the middle of the tube.....4. *A. shawii.*

1. **A. utahensis** Engelm. Trunk subterranean; flowering stem 5 to 8 feet high; leaves thick, hard, 6 to 12 inches long, margined by white teeth and tipped by a spine ½ to 3 inches long; flowers yellow, 1 to 1¼ inches long; perianth abruptly expanded above the tube, its lobes 5 to 6 lines long, 3 times as long as the very short free portion of the tube; capsule 1 to 1½ inches long, dark brown.

Death Valley region. East to southern Utah and northern Arizona.

Locs.—Resting Sprs., acc. Coville; Ivanpah, acc. Mulford; Bonanza King Mine, Providence Mts., *Munz, Johnston & Harwood* 4302; Horn Mine, Turtle Mts., *C. L. Camp.* Sheep Mts., Nev., *Purpus* 6135.

Refs.—Agave utahensis Engelm.; Wats. Bot. King, 497 (1871), type loc. St. George, Utah, *Palmer*; Cov. Contrib. U. S. Nat. Herb. 4:201 (1893); Mulford, Rep. Mo. Bot. Gard. 7:77, pl. 32 (1896).

2. **A. consociata** Trel. (Fig. 59.) Plants usually forming very dense and commonly circular colonies 3 to 12 feet broad; trunk none, the leaves densely clustered at the base; flowering stem slender, 6 to 12 feet high; leaves thick and fleshy, blue-green, 6 to 12 inches long, edged with straight or curved pale teeth and tipped with a slender black spine; inflorescence slender, rather sparse; flowers yellow, 1½ to 2¼ inches long; perianth lobes 7 to 8 lines long, the free portion of the tube only 1½ to 2 lines long; capsule 1¼ to 1¾ inches long, dark brown, abruptly short-pointed at apex.

San Jacinto Mts. south to eastern San Diego Co. Lower California.

Econ. Note.—The central part of the rosette and the young flower stalk are roasted for food by the Coahuilla Indians who also use the leaf fibres, says Dr. D. P. Barrows, for the manufacture of cordage, ropes and bowstrings. The fibres are prepared by soaking and basting the leaves; an old woman then takes a handful, combs them straight between her

Fig. 59. AGAVE CONSOCIATA Trel. Palm Cañon of Mt. San Jacinto. (Jepson, photo.)

fingers, wets the ends with saliva and "twists them into a beautiful cord on her bare thigh." Brooms are also made of the fibres. The flowers are boiled, dried for storing, and then boiled again when eaten. Cf. Barrows, Ethno-Bot. Coahuilla Ind. 47, 54, 58, 66.

Locs.—Palm Cañon, Mt. San Jacinto, *Jepson* 1356; Mason Valley, e. San Diego Co., *Jepson* 8710.

Refs.—AGAVE CONSOCIATA Trel. Rep. Mo. Bot. Gard. 22:53 (1911), type loc. San Felipe, *Parish* 413. *A. deserti* mostly of Cal. authors.

3. **A. deserti** Engelm. Similar to A. consociata, the plants forming rather open and more or less circular colonies 5 to 15 feet broad; scapes stout, 10 to 16 feet high; leaves whitish-green, 10 to 15 inches long; inflorescence large, dense; capsules 1 to 1⅓ inches long, light brown, rounded at apex.

San Felipe region, eastern San Diego Co.

Loc.—Mason Valley, *Jepson* 8711.

Refs.—AGAVE DESERTI Engelm. Trans. Acad. Sci. St. Louis, 3:310 (1875), based on spms. from the region of San Felipe, *Hitchcock, Palmer*; Trel. Rep. Mo. Bot. Gard. 22:52, pls. 41, 42 (1911).

4. **A. shawii** Engelm. Trunk 8 to 12 inches high, regularly leafy, the flowering stem 8 to 12 feet high; leaves green, glossy, ovate or lanceolate-ovate, acuminate, 8 to 20 inches long, margined with garnet-red hooked prickles; clusters of the panicle congested; flowers greenish-yellow, 3½ to 4½ inches long; perianth lobes 8 to 10 lines long, the free portion of the tube 7 to 9 lines long.

Southwestern San Diego Co. near the coast at the boundary, thence into Lower California.

Loc.—San Diego, *W. S. Wright* 113.

Refs.—AGAVE SHAWII Engelm. Trans. Acad. Sci. St. Louis, 3:315 (1875), type loc. first boundary monument near San Diego, *Parry;* Mulford, Rep. Mo. Bot. Gard. 7:83, pls. 44–47 (1896).

IRIDACEAE. IRIS FAMILY

Perennial herbs, ours low, glabrous, with stout stems and 2-ranked sword-like and sheathing leaves. Inflorescence terminal. Flowers perfect, with petal-like perianth of 6 divisions in 2 whorls. Stamens 3, on the base of the outer whorl, with extrorse anthers. Ovary inferior, 3-lobed, becoming a 3-celled capsule. Style 3-cleft or rarely entire; stigmas 3.—About 57 genera and 1000 species, mostly temperate and tropic zones.

Bibliog.—Baker, J. G., Handbook of the Irideae (1892). Hansen, J. G., Iris hartwegii (Gard. & For. 10:95–96,—1897). Bicknell, E. P., Studies in Sisyrinchium.—S. californicum and Related Species of the Neglected Genus Hydastylus (Bull. Torr. Club 27:373–387,—1900); The Species of California (l.c. 31:379–391,—1904). Dykes, W. R., The Genus Iris, pls. 1–47 (1913).

Stems terete; divisions of the perianth in two unlike whorls.....1. IRIS.
Stems 2-edged or -winged; divisions of the perianth alike.....2. SISYRINCHIUM.

1. IRIS L. FLAG

Stems terete, from creeping stout rootstocks. Flowers in the axils of spathaceous bracts. Perianth-tube prolonged beyond the ovary; outer segments or sepals obovate above the claw, spreading or recurved; inner segments or petals narrower, erect. Style divided into 3 petal-like branches, each branch with 2 lobes or appendages at summit; stigma a small projecting shelf (stigmatic only on the upper surface) situated on the lower surface of the branch just below the lobes or appendages. Stamens with linear anthers lying close beneath the branches of the style, i.e., opposite them. Capsule oblong, 3-angled. Seeds flattened or turgid, in 2 rows in each cell.—Species about 100, all continents but mostly north temperate zone. (Greek iris, the rainbow, the Greek species of the genus being celebrated for its brilliant colors.)

Rootstock ½ inch thick or more; dying leaves gray or yellow-brown; seeds globular or pyriform.
Plant sturdy; mature leaves as long or longer than stem, 4 to 6 lines wide.....1. *I. longipetala.*
Plant slender; leaves shorter than stem, 2 to 4 lines wide.....2. *I. missouriensis.*

Rootstock ¼ inch thick or less; dying leaves red-brown; seeds roughly angled, or spherical in no. 3.

Stem 1¼ to 2 feet high; leaves 3½ to 6½ lines broad, strongly ribbed; pedicels about 1 inch long; perianth-tube commonly ½ inch long.....3. *I. douglasiana.*

Stem commonly less than 1 foot high; leaves 3 lines broad or less, thickened, ribs less prominent.

Perianth-tube 1½ to 3¾ inches long; pedicels ½ inch long.....4. *I. macrosiphon.*

Perianth-tube ¼ inch long; pedicels ½ to 3 inches long.....5. *I. hartwegii.*

1. **I. longipetala** Herbert. COAST IRIS. Stem very stout, compressed, 1 to 2 feet high; leaves 4 to 6 lines broad, equaling or rather exceeding the flower-peduncles, turning gray or yellow-brown when dying; pedicels ½ to 3½ inches long; bracts scarious at apex, 2½ to 4 inches long, ¾ to 1⅜ inches broad (when spread out); sepals white, veined with violet, or violet above, 3 inches long, 1¼ to 1⅜ inches broad, narrowed to a short claw, the claw with a very prominent ventral ridge which disappears in the middle of the blade; petals light violet, 2¾ inches long, 6 to 7 lines wide; capsule narrowed at each end, 2 inches long; seeds pyriform.

Wet heavy soil, usually forming dense colonies: coastal region from San Francisco Bay to Monterey Co. Apr.

Locs.—Point Isabel, Contra Costa Co., *Davy*; Bald Peak, Berkeley Hills, *Hall*; South San Francisco, *C. F. Baker* 348; Monterey, *F. Guirado* 609.

Refs.—IRIS LONGIPETALA Herbert; H. & A. Bot. Beech. 395 (1841), type from Cal., *Douglas;* Hook. Bot. Mag. t. 5298 (1862); Jepson, Fl. W. Mid. Cal. 129 (1901); Dykes, The Genus Iris, 89 (1913).

2. **I. missouriensis** Nutt. WESTERN BLUE FLAG. Stem 10 to 24 inches high, exceeding the leaves (or a few leaves scarcely longer), nearly naked except at base; rootstock short, thick; leaves 2 to 4 lines wide, turning gray or yellow-brown when dying; bracts usually opposite, commonly membranous and straw-color, or sometimes thin, herbaceous; pedicels (1 or) 2 to 4 inches long; sepals whitish or pale blue, veined with purple and often with a central yellowish spot; petals pale blue to white, 2 to 2½ inches long, the tube about ¼ inch long; capsule 1½ to 3 inches long, grooved trough-wise on each face, cylindric in outline, or narrowed to both apex and base; seeds globular to pyriform.

Moist places, meadows or wet flats, high mountains: Sierra Nevada (mostly on the crest and east slope, rare on the west slope), southerly to the San Bernardino Mts., east to eastern Inyo Co., north to Modoc Co., thence southwesterly to the inner North Coast Range in Solano Co. in low valleys. Throughout the Great Basin and north to British Columbia and Dakota. July.

Locs.—Bear Valley, San Bernardino Mts., *Hall* 1024; Bitter Creek, Mt. Pinos, *Hall* 6512; Silver Cañon, White Mts., *Jepson* 7208; Snow Creek, Mariposa Co., *Congdon*; Hetch-Hetchy, *Jepson* 3461; Walker Lake, Mono Co., *Jepson* 4446; Kennedy Lake, Tuolumne Co., *A. L. Grant*; Sonora Pass, *A. L. Grant* 307; Horse Lake, Lassen Co., *Jepson* 7811; Hat Creek, *Alma Ames*; Mt. Bidwell, *Manning* 56; Egg Lake, *M. S. Baker*; Goose Lake Valley, *R. M. Austin* 75; upper Fall River Valley, *Jepson* 5769; Quartz Valley, Siskiyou Co., *Butler* 1467; Black Butte, Mendocino Co., *W. W. Mackie*; Mendocino Range near Hopland, *Jepson* 7645; Rockville, w. Solano Co., *Jepson* 8247.

Refs.—IRIS MISSOURIENSIS Nutt. Jour. Acad. Phila. 7:58 (1834), type loc. sources of the Missouri River, *Wyeth*; Baker, Bot. Mag. t. 6579 (1881); Dykes, Genus Iris, 90 (1913).

3. **I. douglasiana** Herbert. MOUNTAIN IRIS. Stem 1¼ to 2 feet high, much exceeded by the (3 to 9 lines wide) basal leaves, these reddish at base; bracts broader and less acuminate than in I. macrosiphon; flowers 2 or 3 in a pair of bracts, mostly cream-color, lavender or azure, often purple or lilac, the pedicels commonly 1 (½ to 1¼) inches long; perianth-tube usually ½ sometimes to 1½ inches long; petals 2 to 3 inches long; capsule narrowly oblong, sharply angled, 1¾ to 2 inches long; seeds spherical (or obovoid).

Common in the Redwood belt and on chaparral slopes in the Coast Ranges near the coast from Monterey Co. northwards; rare in the northern Sierra

Nevada. Oregon. May-June. The color of the flowers is exceedingly variable, but the species may be known from the next by its longer pedicels, shorter perianth-tube and stouter habit.

Locs.—Little Sur River, *Davy* 7310; Monterey, *Berg*; Anchorage, Santa Cruz Mts., *Carlotta Case*; Los Gatos, *Heller* 7305; Halfmoon Bay, *Geo. B. Furniss* (= var. altissima Purdy in litt.; 3 to 3¼ feet high); Millbrae, San Mateo Co., *Davy* 1021; Lake Merced, San Francisco, *E. Cameron*; Mt. Tamalpais, *Jepson* 7562; Inverness, *Jepson* 8303; Cazadero, *M. S. Baker*; Ukiah, *Bolander* 3909; Sherwood, *Jepson;* Cahto, Mendocino Co., *Jepson*; South Fork Eel River near Idolwild, *Jepson* 1909; Buck Mt., Humboldt Co., *Tracy* 4263; Auburn, Placer Co., *Sonne*.

Refs.—Iris douglasiana Herbert; H. & A. Bot. Beech. 395 (1841), type from Cal., *Douglas*; Jepson, Fl. W. Mid. Cal. 129 (1901); Dykes, Genus Iris 36, pl. 8 (1913). *I. watsoniana* Purdy, Erythea, 5:128 (1897), type loc. Eureka, *Purdy*. *I. amabilis* Eastw. Bull. Torr. Club 30:484 (1903), type loc. Nevada City, *C. W. Kitts*. *I. tenuissima* Dykes, l.c. 44, type loc. Pitt River Ferry, Shasta Co., *Brown* 239.

4. **I. macrosiphon** Torr. Ground Iris. Stems low and slender, nearly naked or commonly clothed with bract-like leaves, much shorter than the basal leaves which are 5 to 12 (or rarely 27) inches long and 1 to 2 lines broad; bracts lanceolate, long acuminate, 2½ to 3½ inches long; flowers 1 or 2, on pedicels 6 to 7 lines long, with slender tube 1½ to 3 inches long; perianth violet-purple or straw-yellow, generally veined or mottled; sepals oblong-obovate or obovate, their lower or middle portion blotched or veined with white, the margin above often undulate; petals oblanceolate, of a uniform color, 1½ to 2¼ inches long; capsule short-oblong, ¾ to 1¼ inches long; seeds roughly angled.

Brushy slopes; 100 to 3000 feet, Coast Ranges from Santa Clara Co. north to Del Norte Co.; thence southeasterly to Butte Co. Also southern Oregon.

Locs.—Gilroy, *C. F. Baker* 1947; Mt. Hamilton, *Jepson* 4202; Ross Valley, *Jepson*; Olema, Marin Co., *Jepson;* Howell Mt., *Jepson* 516; Vaca Mts., *Jepson* 7192 (Weldon Cañon), 2456 (Wild Horse Cañon); Lakeport, *C. F. Baker* 3095; Hoods Peak Range, east of St. Helena, *Jepson*; grade betw. Blue Lakes and Ukiah, *Jepson*; Sherwood Valley, *Davy & Blasdale* 1061; Little Laribee Creek, Humboldt Co., *Tracy* 2684; Hupa, *Manning*; Klamath River, Humboldt Co., *Chandler* 1529; Adam Sta. to Patrick Creek, Del Norte Co., *Jepson* 2908; Marble Mt., *Chandler* 1570; Mt. Shasta, *F. W. Morse*; Little Chico Creek, *R. M. Austin* 13; Penn Valley, Nevada Co., *Jepson*.

Var. **purdyi** Jepson n. comb. Stem clothed with many bract-like leaves; perianth cream-color veined with purple.—Redwood region of Mendocino Co.

Refs.—Iris macrosiphon Torr. Pac. R. Rep. 4:144 (1857), type loc. Corte Madera, *Bigelow*; Jepson, Fl. W. Mid. Cal. 129 (1901); Dykes, Genus Iris 43, pl. 12 (1913). *I. chrysophylla* Howell, Fl. N.W. Am. 1:633 (1897), type loc. southern Oregon, pine woods. Var. purdyi Jepson. *I. purdyi* Eastw. Proc. Cal. Acad. ser. 3, 1:78, pl. 7, fig. 2 (1897), type loc. Mendocino Range near Ukiah, *Purdy*; Dykes, Genus Iris 42, pl. 11 (1913).

5. **I. hartwegii** Baker. Sierra Iris. Stems many, very leafy, 6 to 12 inches high; leaves ¼ inch wide or less; flowers commonly in pairs; pedicels ½ to 3¾ inches long, partly enfolded in the long lanceolate-acuminate bracts, which are borne more or less separate from each other; petals yellow with lavender veins or pale lavender with deeper-colored veins and a yellow median portion; tube 3 to 5 lines long; sepals and petals 1½ to 2½ inches long; capsule short-oblong, obtusely angled, ¾ to 1 inch long; seeds coarsely wrinkled, cubical.

Dry open forest, 2500 to 6000 feet: western slope of the Sierra Nevada from Plumas Co. to Kern Co.; southerly to cismontane Southern California. Very like *Iris tenax* Dougl. of Oregon and Washington save in color.

Locs.—McCloud Valley, *M. S. Baker;* Quincy, *Jepson* 4144; Stirling, Butte Co., *Heller* 10803; Jackson, *Hansen* 50; Strawberry, Tuolumne Co., *Jepson* 6522; Italian Bar, Tuolumne Co., *Jepson* 6356; El Portal, *Jepson* 3123a; Grouse Creek, Wawona Road, *Jepson* 8382; Dinkey Grove, Fresno Co., *A. L. Grant*; Colony Mill, Kaweah, *Hopping* 16: North Tule River, *Purpus* 5684; San Bernardino Mts., *Parish* 3084 (Grass Valley), 2466 (Strawberry Peak).

Refs.—Iris hartwegii Baker, Gard. Chron. 2:323 (1876), type loc. Bear Creek, Nevada Co., *Hartweg* 373; Dykes, Genus Iris, 40, pl. 10 (1913). Var. *australis* Parish, Erythea 6:86 (1898), type loc. Cuyamaca, *Hall*.

2. SISYRINCHIUM L.

Stems slender, compressed and usually 2-edged or 2-winged, often geniculate, from fibrous roots, with grass-like or lanceolate leaves and fugacious relatively small flowers in umbels enclosed by 2 sheathing herbaceous bracts, with a scarious bractlet subtending each pedicel. Perianth 6-parted, the divisions alike, spreading. Stamens monadelphous, their anthers alternate with the 3 style branches or stigmas; stigmas thread-like.—Species 50, North America and the West Indies. (Name of Theophrastus for a bulbous plant allied to Iris.)

Stems 2-margined; perianth 4 to 7 lines long; spathe bracts generally shorter than or equal to the flowers.
- Flowers blue; filaments united to the top; anthers ⅕ to ⅓ as long as the filaments; style entire, stigmas short ..... 1. *S. bellum.*
- Flowers yellow; filaments united only at base; anthers equal to the filaments; style deeply cleft ..... 2. *S. californicum.*

Stems not margined but compressed; perianth 6 to 10 lines long, reddish-purple; outer spathe bract commonly exceeding the flowers ..... 3. *S. grandiflorum.*

1. **S. bellum** Wats. BLUE-EYED GRASS. NIGGER-BABIES. Stems erect, simple or somewhat branching, 10 to 20 inches high; leaves shorter than the stem, 1 to 2½ lines wide; spathes of 2 nearly equal bracts 10 to 16 lines long, enclosing 3 to 7 flowers; perianth purplish (or sometimes very pale) blue, yellow at base, the segments oblong-obovate, conspicuously 4 to 6-nerved, 4 to 7 lines long, emarginate at apex, with a slender tooth in the notch, the inner narrower; anthers short, sagittate; style abruptly thickened or obelavate at apex (at least when young), divided at tip into 3 short stigmas; capsule globose, 2 to 3 lines long.

Moist grassy slopes, very common throughout California, rare in the deserts and arid areas east of the Sierra Nevada. Mar.-May.

Locs.—Sierra Nevada: Egg Lake, Modoc Co., *M. S. Baker*; Honey Lake, Lassen Co., *Davy* 3302; Colby, Butte Co., *E. M. Austin* 34; Tallac, *C. J. Fox Jr.*; Columbia, *Jepson* 6351; Herring Creek, Tuolumne Co., *A. L. Grant* 82; Yosemite Valley, *Hall* 9213; Kern River Cañon, *Jepson* 4979. Coast Ranges: Goosenest foothills, *Butler* 885; Quartz Valley, Siskiyou Co., *Butler* 1556; Comptche, Mendocino Co., *Harriet Walker* 290; Franz Valley grade, near Calistoga, *Jepson*; St. Helena, *Jepson*; Berkeley Hills, *Jepson* 9166; Mission San Jose, *Jepson* 2469; Los Gatos, *Heller* 7291; Monterey, *Elmer* 3522. Southern California: Santa Barbara, *Brewer* 366; Monrovia Cañon, *Peirson* 444; Pomona, *Braunton* 195; San Antonio Cañon, *Peirson* 11; San Bernardino, *Parish*; Santa Ana Cañon, *Hall* 7606; Tauquitz Valley, San Jacinto Mts., *Hall* 2470; San Diego, *Jepson* 6660.

Refs.—SISYRINCHIUM BELLUM Wats. Proc. Am. Acad. 12:277 (1877), based on California spms.; Bot. Cal. 2:140 (1880); Jepson, Fl. W. Mid. Cal. 129 (1901). *Bermudiana bella* Greene, Man. Bay Reg. 308 (1894). *Sisyrinchium leptocaulon* Bicknell, Bull. Torr. Club, 26:451 (1899), type loc. Lake Tahoe, *J. Ball*; l.c. 31:381 (1904). *S. idahoense* Bicknell, l.c. 26:445 (1899), as to California plants. *S. maritimum* Heller, Muhl. 1:48 (1904), type loc. Pacific Grove, *Heller* 6538, a low or stocky form in the sand hills by the sea. *S. oreophilum* Bicknell, l.c. 31:381 (1904), type loc. Yosemite Valley, *Bioletti*. *S. greenei* Bicknell, l.c. 31:383 (1904), type loc. n. side of Mt. Shasta, *H. E. Brown* 351. *S. eastwoodiae* Bicknell, l.c. 31:385 (1904), type loc. San Bernardino Valley, *S. B. & W. F. Parish* 663. *S. hesperium* Bicknell, l.c. 31:390 (1904), type loc. Dutard's Ranch, boundary Santa Barbara and San Luis Obispo cos., *Eastwood*.

Note on variation.—It is possible that the species proposed by Bicknell and others lack definiteness because insufficiently differentiated from extensive materials not used by them. The species, S. bellum, as here accepted, has a wide geographic range and an altitudinal range from 20 to 400 feet or in Southern California to 6000 feet; specimens from so wide a range show certain differences in size, habit, hue and number of flowers (differences which one readily associates with differences in moisture, soil or exposure) but they seem to lack technical characters on which to differentiate a series of species. Field notes of flowers and collections of fruiting material are, however, needed for more conclusive studies.

The plants in the desert region east of the Sierra Nevada do not seem substantially different from those of cismontane California. They grow in alkaline spots but the plants of the Coast are adapted to a wide variety of soils and sometimes grow in wet semi-alkaline valleys. The two climates, the desert and coast, are radically different but if it be said that the coast and desert forms must represent different species because the two climates are so different then the Aquilegia truncata, as it occurs in the Panamint Mts. (to mention only a single case) must be made a species distinct from the Aquilegia truncata plants of the coast, which no one so far has thought of doing. The facts are that the moisture conditions and the climatal

conditions during the reproductive phase are sufficiently alike to enable one species to have a wide range. Hence we quote here: *S. halophilum* Greene, Pitt. 4:34 (1899), type loc. Humboldt Wells, Nev.; Bicknell, Bull. Torr. Club, 26:450 (1899); 31:380 (1904). *S. funereum* Bicknell, l.c. 387 (1904), type loc. Furnace Creek Cañon, Funeral Mts., *Coville & Funston* 225; spms. from Texas Spring, near Furnace Creek (*Jepson* 6872), have bracts with only 1 to 3 (or 4) flowers.

2. **S. californicum** Dry. Golden-eyed Grass. Stems unbranched, 4 to 12 (or 15) inches high, broadly winged, exceeding the leaves; bracts rather unequal, enclosing 3 to 7 flowers; perianth bright yellow; segments 4 to 6 lines long, 5 to 7-nerved, obtuse or acutish; anthers versatile, 1½ lines long, about equaling the filaments; style cleft to below the middle; capsule obovate-oblong, 4 lines long.

Wet places, infrequent: cismontane Southern California, Sierra Nevada and Coast Ranges. Northward to Oregon. Apr.

Locs.—Sugarloaf Mt., San Bernardino Co., *Hall* 7536; Middle Tule River, *Purpus* 5237; Junction Mdw., Kern Cañon, *Jepson* 5017; Wawona, *Congdon;* Crystal Sprs., San Mateo Co., *Eastwood;* Cliff House, San Francisco, *Drew*; Inverness, *Jepson* 8297; Eureka, *Tracy* 3247.

Refs.—Sisyrinchium californicum Dryander; Ait. f. Hort. Kew, ed. 2, 4:135 (1812); Jepson, Fl. W. Mid. Cal. 130 (1901). *Marica californica* Ker, Bot. Mag. t. 983 (1807), type loc. "Northwest Coast," *Menzies. S. elmeri* Greene, Pitt. 2:106 (1890), type loc. Lake Eleanor, Tuolumne Co., *Drew. Bermudiana californica* Greene, Man. Bay Reg. 308 (1894). *Hydastylus elmeri* Bicknell, Bull. Torr. Club, 27:380 (1900). *H. rivularis* Bicknell, l.c. 381 (1900), type loc. Bubb's Creek, Fresno Co., *Eastwood.*

3. **S. grandiflorum** Dougl. Scapes 6 to 12 inches high, bright green, exceeding the long-sheathing leaves; spathe 1 to 4-flowered; bracts very unequal, the outer usually much exceeding the broadly campanulate flowers; perianth-segments dark reddish-purple, rarely white, 6 to 10 lines long; filaments broad at base, 3 to 4 lines long, united ⅓ their length; anthers versatile, 2 lines long; style 6 to 7 lines long, cleft at apex, the branches thread-like, 1 line long or less; capsule depressed-globose, 6 to 8 lines long.

Moist places, hills and mountain slopes: Lassen and Modoc cos. westerly to Humboldt Co. North to British Columbia and east to Idaho and Nevada. Mar.-Apr.

Locs.—Milford, Lassen Co., *M. S. Baker;* Mt. Bidwell, *Manning* 82; Alturas, *L. S. Smith* 927; Lake City Pass, Modoc Co., *R. M. Austin*; Yreka, *Butler* 561, 646; Harris, Humboldt Co., *Ethel Tracy.* Mosier, e. Oregon, *Howell.*

Refs.—Sisyrinchium grandiflorum Dougl.; Lindl. Bot. Reg. t. 1364 (1830), type loc. great falls of the Columbia River, *Douglas. Olsynium grandiflorum* Rafin. New Fl. Am. 1:72 (1836). *Olsynium douglasii* Bicknell, Bull. Torr. Club 27:237 (1900).

ORCHIDACEAE. Orchid Family

Perennial herbs with corms, bulbs, tuberous roots or rootstocks and sheathing leaves often reduced to scales. Flowers perfect, irregular, bracted, either solitary or in spikes or racemes. Sepals 3, alike. Petals 3, 2 alike; the third petal called the "lip" commonly dissimilar in color, size and shape, often enlarged, sac-like or spurred, in our genera most frequently brought into an inferior position (i.e., on the lower side of the flower), by twisting of the ovary. Filaments united with the single style forming a column; perfect anther 1 (in Cypripedium 2), situated on the apex of the column and just above or behind the stigma, which is a viscid surface facing the lip. Pollen agglutinated into 2 to 8 pear-shaped masses. Ovary inferior, commonly long and twisted, 1-celled. Fruit a 3-valved capsule. Seeds innumerable, minute.—About 410 genera and 6500 species, all zones but abundant only in the tropics; the largest order of Monocotyledons and the third largest order of flowering plants.

Bibliog.—Nuttall, T., Remarks on the Species of Corallorhiza Indigenous to the U. S. (Jour. Acad. Phila. 3:135–139,—1823). Wiegand, K., Revision of the Genus Listera (Bull. Torr. Club 26:157–171, pls. 356, 357,—1899). Rydberg, P. A., Am. Species of Limnorchis and Piperia north of Mexico (Bull. Torr. Club 28:605–643, figs. 1:34,—1901). Ames, Oakes, American Species of Spiranthes (Orchidaceae, 1:113–154,—1905), The Genus Habenaria in North America (l.c. 4:1–288, pls. 60–79,—1910). Pfitzer, E., Cypripedium (Engler, Pflzr. 4[50]:28–42 (1903).

Leaves foliaceous, i.e. the plants with green herbage.
Flowers solitary or several, showy; lip large and sac-like.
Leaves 2 to many, cauline; sepals and petals brown or greenish-yellow....1. CYPRIPEDIUM.
Leaf 1, basal; sepals and petals rose-purple....2. CYTHEREA.
Flowers many, spicate or racemose; lip various, but not saccate (except in no. 5).
Perianth with a spur....3. HABENARIA.
Perianth spurless.
Flowers in a spike.
Spike dense and twisted; leaves uniformly green....4. SPIRANTHES.
Spike more slender; leaves with white or light-colored markings....5. PERAMIUM.
Flowers in a raceme.
Leaves many; flowers ½ inch long or more; bracts conspicuous, foliaceous....6. EPIPACTIS.
Leaves 2; flowers less than ½ inch long; bracts small....7. LISTERA.
Leaves reduced and scale-like, the whole plant destitute of green herbage.
Plants white; perianth not gibbous or spurred; lip with saccate base and broad wing-like margins above....8. CEPHALANTHERA.
Plants reddish-brown or purple, rarely yellow; perianth gibbous over the ovary or spurred; lip without saccate base....9. CORALLORRHIZA.

1. **CYPRIPEDIUM** L. LADY'S SLIPPER

Stems leafy, rough-pubescent, from tufted fibrous roots. Leaves 2 to many, large. Flowers few or solitary, large and showy, leafy bracted. Sepals spreading, in ours seeming as if only 2, the lateral completely or almost completely united into one under the lip, which is an inflated sac with the incurved margin auricled near the base. Column very short, incurved, terminating in a disk-like stigma. Fertile anthers 2, on short filaments, one on each side of the column below the stigma; sterile anther conspicuous, roundish or ovate, situated on the upper side and over-arching the stigma.—Species 28, North America and Asia. (Latin Cypris, Venus, and pes, a foot, the saccate lip a fit buskin for the goddess.)

Stem with several alternate leaves, 1 to 2 feet high.
Petals linear-lanceolate, 1½ to 2 inches long....1. *C. montanum.*
Petals oblong, 6 to 7 lines long....2. *C. californicum.*
Stem with 2 opposite leaves, 2 to 10 inches high; sepals and petals lanceolate, 6 to 12 lines long....3. *C. fasciculatum.*

1. **C. montanum** Dougl. Stem 1 to 2 feet high, rough-pubescent with short glandular hairs; leaves elliptic- to narrowly-ovate, the largest 5 or 6 inches long and 3 inches broad; flowers 1 to 3, shortly pediceled; sepals and wavy-twisted petals usually dark brown, linear-lanceolate, 1½ to 2½ inches long; lower sepals united almost to the apex, only the lanceolate-subulate tips free; lip 1 inch long, dull white, veined with purple; sterile anther ovate, 4 lines long, on a slender filament; capsule erect or nearly so, oblong, 10 lines long.

Dense woods: Coast Ranges from the Santa Cruz Mts. to Siskiyou Co., thence southeasterly in the Sierra Nevada to Mariposa Co. Far north to Washington and Idaho.

Locs.—Santa Cruz Mts., acc. *Anderson;* Ukiah, *Blasdale*; Sherwood Valley, *Blasdale* 1047; Hupa, *Manning* 16; Weaverville, *Yates* 311; Goosenest Mt., *Butler* 1586; Forestdale, Modoc Co., *M. S. Baker*; Butterfly Valley, Plumas Co., *R. M. Austin* 197; Grouse Creek, Yosemite, *Jepson* 4287.

Refs.—CYPRIPEDIUM MONTANUM Dougl.; Lindl. Gen. & Sp. Orch. 528 (1840), type loc. northwest America, *Douglas*; Jepson, Fl. W. Mid. Cal. 131 (1901); Anderson, Nat. Hist. Santa Cruz Co. 43 (1893).

2. **C. californicum** Gray. Stem stout, rough-pubescent, 1 to 2 feet high; leaves ovate-lanceolate (or ovate), acute or acuminate, 3 to 6 inches long, the upper lanceolate and gradually reduced to foliaceous bracts of the long loose raceme; flowers 1 to 6, short-pedicelled, greenish-yellow; sepals ovate, acute, 6 to 8 lines long, the two lower united to the apex, equaling the oblong-linear acutish petals; lip obovoid, white or light rose-color, veined with purple, 8 to 10 lines long, pubescent within at the base; sterile anther rounded and arching,

nearly sessile, 2 lines long, equaling the roughened stigma; capsule oblong, reflexed, 8 to 15 lines long.

Marin Co.; Del Norte Co., thence easterly to Lassen Co. Southern Oregon.

Locs.—Mt. Tamalpais, *Edith M. Wickes*; Siskiyou Mts., *Blasdale* 1077; Gasquets, Del Norte Co., *Davy*; Sisson, *Hall & Babcock* 4043; Mt. Dyer, Lassen Co., *R. M. Austin.*

Ref.—Cypripedium californicum Gray, Proc. Am. Acad. 7:389 (1867), type loc. Red Mt., n.w. Mendocino Co., *Bolander.*

3. **C. fasciculatum** Kell. Stems slender, 2 to 10 inches high, pubescent, scariously sheathed at base; leaves 2, nearly opposite, ovate to nearly orbicular, 2 to 4 inches long, pale green, with 3 prominent ribs beneath; flowers solitary or 2 to several in a small terminal cluster; sepals and petals lanceolate, acuminate, 6 to 12 lines long, greenish-brown with brown veins; lateral sepals wholly united or very nearly so; lip depressed-ovate, greenish-yellow with brown or purplish margin, 4 to 6 lines long; sterile anther oblong, obtuse, equaling the stigma.

Dry open hillsides: Santa Cruz Co.; Plumas Co. to Del Norte Co. North to Washington.

Locs.—Glenwood, acc. *Eastwood*; Plumas Co., *R. M. Austin*; Butte Valley, *R. M. Austin* 198.

Refs.—Cypripedium fasciculatum Kell.; Wats. Proc. Am. Acad. 17:380 (1882), type loc. White Salmon River, Wash., *Suksdorf*; Eastwood, Muhl. 3:97 (1907).

2. **CYTHEREA** Salisb.

Low herb with a corm and coral-like roots. Stem scape-like, sheathed by a few scale-like leaves, a single petioled leaf at base and a single drooping terminal flower. Flowers large, showy. Sepals and petals similar, equal, distinct; lip sac-like, terminating in 2 short spurs protruding from beneath a winged margin; upper side of sac inside with 3 densely ciliate ridges running from the opening towards the spurs, with 2 short spurs below the expanded apex. Column broadly winged, almost oval, concave, and petal-like; anther hemispherical, borne just below the summit, opening by a lid.—Species 1, North America, Europe. (Surname of Venus.)

1. **C. bulbosa** House. Calypso. Stem 4 to 5 inches high, the sheathing scales 1 to 2 inches long; leaf ovate, cordate or truncate at base, 1¼ to 2¼ inches long; petiole ½ to 1½ inches long; sepals and petals rose-purple, sometimes pale, linear-lanceolate, 9 lines long; lip as long or slightly longer, ovate-inflated, reddish brown and mottled.

Bogs or in leaf-mold in redwood or pine forests from Marin Co. to Siskiyou and Del Norte cos. North to Alaska and east across the continent.

Locs.—Bolinas Ridge acc. Eastwood; Cazadero, *Davy* 1652; Mendocino, *Mary G. Clark*; Sherwood Valley, *C. W. Bradford*; Carrville, Trinity Co., *Helen MacIlvain*; Hupa, *Chandler* 1280; Shackelford Creek, w. Siskiyou Co., *Butler* 1512; Crescent City, *Goddard* 317.

Refs.—Cytherea bulbosa House, Bull. Torr. Club 32:382 (1905). *Cypripedium bulbosum* L. Sp. Pl. 951 (1753), type European. *Calypso borealis* Salisb.; Davy, Erythea 4:104 (1896); Jepson, Fl. W. Mid. Cal. 134 (1901). *Calypso bulbosa* Oakes, Cat. Ver. Pl. 28 (1842), f. *occidentalis* Holz. Contrib. U. S. Nat. Herb. 3:251 (1895). *C. occidentalis* Heller, Bull. Torr. Club 25:193 (1898).

3. **HABENARIA** Willd. Rein-orchis

Stems erect, leafy at least at base, solitary from fleshy tuber-like roots. Flowers greenish, yellowish, or white, in a terminal spike or raceme. Sepals equal, the lateral mostly spreading, the petals a trifle smaller. Lip spreading or drooping, in ours entire, produced at base into a long slender spur. Column very short. Anther-sacs more or less divergent.—Species 300, all continents. (Latin habena, a thong or rein of a horse, on account of the shape of the spur in some species.)

Stem leafy at base; leaves withering at or before anthesis; lip with a more or less distinct median ridge; upper petals straight.
Spur shorter than the ovary; spike with flowers openly spaced.....1. *H. unalaschcnsis.*
Spur equaling or exceeding the ovary.
Slender, the spike lax, attenuate at tip; flowers whitish.....2. *H. elegans.*
Stout, the spike dense.
Spike narrowly cylindric, rounded in outline at tip; flowers greenish....3. *H. michaeli.*
Spike cylindric-conical; flowers white.....4. *H. maritima.*

Stem leafy; leaves remaining until fruit is set; lip flat or concave without median ridge; upper petals inarched and overlapping at tip.
Flowers white; stem thickened; lip rhombic-lanceolate.....5. *H. leucostachys.*
Flowers greenish; stem very slender; lip narrowly linear.
Spur slender, equaling or longer than lip.....6. *H. sparsiflora.*
Spur short, sac-like, shorter than lip.....7. *H. saccata.*

1. **H. unalaschensis** Wats. Stem rigid, straight, erect, 1 to 2 (or rarely 3) feet high; leaves 3 or 4, basal, drying up by flowering time, 6 to 8 inches long, the lowest oblong, the upper oblong-lanceolate, longer; flowers greenish or yellowish green, openly spaced on the long tapering spike and exceeding the ovate-lanceolate bracts; perianth-segments 1 to 2 lines long; sepals translucent; upper sepal ovate-acute, somewhat deflexed between the greenish petals; lateral sepals and petals oblong-lanceolate; lip ovate, rounded at the apex, rather thick with a prominent ridge down the middle; spur thick, clavate, about equaling, or exceeding the lip, shorter than the ovary; capsule 6 to 8 lines long at maturity.

Dry soil, pine and fir forests: cismontane Southern California, Sierra Nevada, northerly to Siskiyou Co., thence southerly to Humboldt Co. Far north to Alaska.

Locs.—Cottonwood Creek, San Diego Co., *T. Brandegee*; Cuyamaca, *T. Brandegee*; Cajon Hills, *Dunn*; Del Mar, *T. Brandegee*; Paradise Valley, *D. Cleveland* 864; Hunsacker Flat, San Bernardino Mts., *Hall* 1356; Huntington Lake, Fresno Co., *A. L. Grant*; Wawona, *Jepson* 4307; Hetch-Hetchy, *A. L. Grant* 862; Strawberry, Tuolumne Co., *Jepson* 6498; Bear Valley, Nevada Co., *Sonne*; Mt. Shasta, *Jepson*; Yreka. *Greene*; Hupa, *Davy & Blasdale* 5637.

Refs.—HABENARIA UNALASCHENSIS Wats. Proc. Am. Acad. 12:277 (1877). *Spiranthes unalaschensis* Spreng. Syst. 3:708 (1826), type loc. Aleutian Isl. *Montolivaea unalaschensis* Rydb. Mem. N. Y. Bot. Gard. 1:107 (1900). *Piperia unalaschensis* Rydb. Bull. Torr. Club 28:270, 635 (1901). *Habenaria cooperi* Wats. l.c. type loc. San Diego, *Cooper*. *Piperia cooperi* Rydb. l.c. 636. *P. lancifolia* Rydb. l.c. 637, type loc. Sierra Santa Monica, *H. E. Hasse* 5675.

2. **H. elegans** Jepson. Slender, strict, 10 to 14 inches high; basal leaves oblanceolate to lanceolate, 2 to 3½ inches long, those of the stem rednced and acuminate or often almost none; spike slender, laxly flowered, attenuate at apex, 5 to 7 inches long; flowers whitish; upper sepal lanceolate; lip oblong-ovate, obtuse, spur as long as or a little longer than the ovary.

Southern California and Coast Range woods mostly near the coast from Monterey Co. north to Humboldt Co.; Sierra Nevada.

Locs.—Samoa, Humboldt Co., *Tracy* 880; Elk Mt., Lake Co., *Jepson* (nearest H. elegans but with the outline of spike and the lip of H. michaeli); Calistoga, *Jepson*; Miller Cañon, Monterey Co., *Hall* 10074; Palomar, *Hall* 5475.

Var. **elata** Jepson n. var. Taller (to 2¼ feet high); spike stouter, elongated (10 to 13 inches long), slenderly attenuate.—(Elatior; spica robustior, elongata, unc. 10–13 longa, ad apicem perattenuata.)—Brushy hillslopes, Vaca Mts. to Alameda Co.

Locs.—Gates Cañon, Vaca Mts., *Jepson* (type); Berkeley Hills, *Jepson* 8192; Oakland Hills, *Bolander* 2431.

Refs.—HABENARIA ELEGANS Jepson. *Platanthera elegans* Lindl. Gen. &Sp. Orch. 285 (1835), type from Northwest America, *Douglas*. *Montolivaea elegans* Rydb. Mem. N. Y. Bot. Gard. 1:106 (1900), in part. *Piperia elegans* Rydb. Bull. Torr. Club 28:270, 638 (1901). *P. leptopetala* Rydb. Bull. Torr. Club 28:637 (1901), type loc. mts. east of San Diego, *Parry*. *P. multiflora* Rydb. l.c. 638, type loc. Gray's Harbor, Wash., is a form with narrow petals and sepals. *P. longispica* Rydb. l.c. 639, resting on *Gymnadenia longispica* Durand, Jour. Acad. Phila. ser. 2, 3:101 (1855), type loc. Nevada City, *Pratten*. *Habenaria longispica* Parish, Pl. World, 20:209 (1917). Var. ELATA Jepson (=*H. elegans* Boland. Cat. Pl. San Franc. 29,—1870).

3. **H. michaeli** Greene. Stout, 10 to 14 inches high; basal leaves oblanceolate, those of the stem prominent, scale-like, lanceolate-acuminate; spike dense, elongated-oblong, 2½ to 6 inches long; flowers greenish; upper sepal ovate; lip triangular-ovate, subcordate at base; spur ⅓ to ½ longer than the ovary.

Open grassy Coast Range hills or under oaks, Humboldt Co. south to Ventura Co.

Locs.—Alton, Humboldt Co., *Tracy* 3763; Mill Valley, *Jepson;* Berkeley, *Mary V. Ferguson;* Livermore, *Jepson;* San Luis Obispo Co., *G. W. Michael.* The following are intergrades between H. michaeli and H. elegans, having the outline of spike, shape of lip and length of spur of the former, and the lax spike and usually spreading perianth of the latter: Sisson, *Jepson;* Shasta Sprs., *Jepson;* Ojai Valley, *Olive Thacher.*

Refs.—HABENARIA MICHAELI Greene, Bull. Cal. Acad. 1:281 (1885), type loc. San Luis Obispo, *G. W. Michael. Piperia michaeli* Rydb. Bull. Torr. Club 28:640 (1901). *H. elegans* Wats. Bot. Cal. 2:133 (1880). H. michaeli is reduced to H. elegans by Ames in his monograph of the genus (Orchid. 4:112); but although these two are not as yet clearly separated they represent in their extreme forms two differentiating phases, ecologically and otherwise, which merit further study and are of too much importance for simple reduction at present.

4. **H. maritima** Greene. (Fig. 60a, b.) Low and stout, 6 to 10 or 14 inches high; basal leaves oblong, acute, 3 to 6 inches long, 1 to 1¾ inches wide, the lowest narrowed to a broad petiole; upper cauline leaves reduced, appressed, lanceolate-subulate; spike very dense and thick, slightly conical, 1½ to 4 inches long, 7 to 13 lines broad; flowers white, with a heavy fragrance; sepals broadly oblong, obtuse, with a green midvein, a little exceeding 2 lines; petals 2 lines long, broadest at the base, ligulate-attenuate above; lip narrowly ovate, with a prominent ridge toward the base; spur slender, longer than the ovary; column short and almost beakless.

Sea-cliffs or coast hills, San Francisco Co. north to Humboldt Co.

Locs.—Mission Hills, *Michener & Bioletti*; Pt. Reyes, *Davy* 6754; Fort Bragg, *W. C. Mathews* 148a; Samoa, Humboldt Co., *Tracy* 1253.

Refs.—HABENARIA MARITIMA Greene, Pitt. 2:298 (1892), type loc. Point Lobos, San Francisco; Jepson, Fl. W. Mid. Cal. 132 (1901). *Piperia maritima* Rydb. Bull. Torr. Club 28:641 (1901).

5. **H. leucostachys** Wats. SIERRA REIN-ORCHIS (Fig. 60c, d.) Stem thickened below, leafy, ¾ to 2½ feet high; leaves linear or lanceolate, ¼ to 1⅓ inches broad; flowers white, rather large, in a dense or open spike 4 to 8 inches long; bracts linear-subulate, shorter than the flower; sepals oblong or oblong-ovate, 3 or 4-nerved, thin, 2 to 3 lines long; petals lanceolate, oblique at base; lip slender-lanceolate from a roundish-dilated base, exceeding the sepals and petals; spur slender, 3 or 4 to 6 lines long, exceeding the lip; beak of the stigma prominent, ovate, more than half the length of the connective; capsule oblong, 6 to 9 lines long.

Common about springs and moist meadows: Sierra Nevada; North Coast Ranges; cismontane Southern California; White Mts. North to Alaska.

Locs.—Sierra Nevada: Plumas Co., *R. H. Platt*; Yuba Pass, Sierra Co., *Alma Ames* 15; Truckee, *Sonne*; Strawberry, Tuolumne Co., *Jepson* 6502; Kennedy Lake, Tuolumne Co., *A. L. Grant* 258; Yosemite Valley, *Hall* 9026; Bloody Cañon, Mono Co., *Chesnut & Drew*; Simpson Mdw., Middle Fork Kings River, *Henrietta Eliot*; Mineral King, *Hall & Babcock* 5386; Giant Forest, *Newlon*; Garfield Forest, Sequoia Park, *Jepson* 4660; Tehachapi, *Greene.* North Coast Ranges: Mt. Shasta, *Jepson*; Goosenest foothills, *Butler* 884; Marble Mt., *Chandler* 1726; Buck Mt., Humboldt Co., *Tracy* 3901; Fort Bragg, *Davy & Blasdale* 6146; Mt. Hull, Lake Co., *Hall* 9545; Point Reyes, *Davy* 6708. Southern California: San Bernardino Mts., *Blasdale*; Mt. San Jacinto, acc. *Hall.* Silver Cañon, White Mts., *Jepson* 7216. Not yet reported from the South Coast Ranges. Var. **virida** Jepson n. var. Lowest leaves elliptic to oblong; flowers greenish.—San Antonio Cañon, San Gabriel Mts., *F. W. Peirson* 12.

Refs.—HABENARIA LEUCOSTACHYS Wats. Bot. Cal. 2:134 (1880). *H. dilatata* var. *leucostachys* Ames, Orchid. 4:71 (1910). *Platanthera leucostachys* Lindl. Gen. & Sp. Orch. 288 (1835), type loc. Northwest Coast, *Douglas. Limnorchis leucostachys* Rydb. Mem. N. Y. Bot. Gard. 1:106 (1900); Bull. Torr. Club 28:625 (1901). *Habenaria pedicellata* Wats. Proc. Am. Acad. 12:276 (1877), type loc. Trinity Mountains (not "Shasta Mountains"), *Brewer* 1453

in part. *H. flagellans* Wats. Bot. Cal. 2:483 (1880), type loc. Indian Valley, Plumas Co., *Lemmon*. Var. VIRIDA Jepson.

6. **H. sparsiflora** Wats. Stem very slender, 12 to 20 (or 30) inches high; leaves oblong-lanceolate; flowers greenish, somewhat scattered in the open spike, usually shorter than the bracts; lower sepals reflexed-spreading; lip narrow, narrowly linear; spur 3 to 4 lines long, equaling or rarely a little longer than the lip; petals deltoid-lanceolate, inarched with tips overlapping; capsule ½ inch long.

Frequent by stream sources, 4000 to 8000 feet: high North Coast Ranges; Sierra Nevada; San Gabriel and San Bernardino mountains. North to Oregon and east to New Mexico and Colorado.

Locs.—Elk Mt., Lake Co., acc. *Tracy*; Trinity Summit, *Manning*; Yuba Pass, Sierra Co., *Alma Ames* 16; Truckee River, *Sonne*; Alder Creek, Yosemite Park, *Jepson* 4332; Chowchilla Mt., *Congdon*; Peregoy Mdw., Yosemite Park, *A. L. Grant* 1295; Nellie Lake, Fresno Co., *A. L. Grant* 1015; Garfield Forest, Sequoia Park, *Jepson* 4660a; Whitewater basin, San Bernardino Mts., *Charlotte Wilder* 1115.

Refs.—HABENARIA SPARSIFLORA Wats. Proc. Am. Acad. 12:276 (1877); Ames, Orchid. 4:102, pl. 61 (1910). *H. thurberi* var. Gray, Proc. Am. Acad. 7:389 (1867), type loc. Mariposa Big Trees, *Bolander* 6251. *Limnorchis sparsiflora* Rydb. Bull. Torr. Club 28:631 (1901). *Limnorchis laxiflora* Rydb. l.c. 630, type loc. Coast Mts., Ore., *Howell*. *Habenaria laxiflora* Parish, Pl. World, 20:209 (1917).

7. **H. saccata** Greene. Stem slender, ¾ to 2 feet high; leaves lanceolate or the lowest oblong; raceme lax or medium, its bracts surpassing the green flowers; lip linear, much longer than the short and thick sac-like spur.

Warner Mts., Modoc Co., 5000 to 7500 feet. North to Alaska and east to Colorado.

Locs.—Pine Creek, *L. S. Smith* 943; Sugarloaf Hill and Davis Creek, acc. *Ames*.

Refs.—HABENARIA SACCATA Greene, Erythea, 3:49 (1895), type loc. Lassen Creek, Modoc Co., *R. M. Austin*; Ames, Orchid. 4:92, pl. 61 (1910). *Platanthera gracilis* Lindl. Gen. & Sp. Orch. 288 (1835), type loc. Observatory Inlet, British Columbia, *Menzies*. *Habenaria gracilis* Wats. Proc. Am. Acad. 12:277 (1877), not Colebr. (1825).

4. SPIRANTHES Rich.

Stem from a cluster of tuberous roots, erect, leafy. Flowers white, spurless, in 1 to 3 ranks in a twisted spike. Sepals and petals all narrow, erect, in ours united into a short tube at base and more or less connivent into a hood above. Lip sessile or with a short claw, the broad lower portion embracing the column and bearing a protuberance on each side, the apical portion spreading and wavy-crisped. Column short, obliquely inserted on the ovary, bearing the stigma on the front and the sessile or short-stalked erect anther on the back. Capsule erect. —Species 40, all continents. (Greek speira, spiral, and anthos, flower, in allusion to the twisted inflorescence.)

Lip roundish at base, narrowed above the middle but strongly dilated at apex; protuberances ridge-like, minute ..... 1. *S. romanzoffiana.*

Lip oblong at base, only slightly dilated at apex; protuberances nipple-like, prominent ..... 2. *S. porrifolia.*

1. **S. romanzoffiana** C. & S. (Fig. 60e, f.) Glabrous, 5 to 16 inches high; leaves oblong-lanceolate, 3 to 7 inches long; spike dense, 1½ to 5 inches long, the flowers dull or greenish white, in 3 ranks; bracts conspicuous, ovate, abruptly subulate-pointed, 5 to 6 lines long; perianth 3 to 6 lines long, curved; lip recurved.

Wet meadows, mostly in the higher mountains: Sierra Nevada (common), Coast Ranges, cismontane Southern California (rare). North to Alaska, east across the continent. July-Sept.

Locs.—Sierra Nevada: Sisson, *Jepson;* Yuba Pass, Sierra Co., *Alma Ames* 14; Bear Valley, Nevada Co., *Jepson*; Mono Crossing, Fresno Co., *A. L. Grant* 1510; Little Kern River, *Purpus* 5266. Coast Ranges: Eureka, *Chesnut & Drew;* Pt. Reyes, *Davy* 6850; San Francisco, *Gardner;* San Carpojo, San Luis Obispo Co., *I. J. Condit*. Southern California: San Bernardino, *Parish*.

Fig. 60. Habenaria maritima Greene, inflorescence, × 1; *b*, flower, × 2. *c*, H. leucostachys Wats., inflorescence, × 1; *d*, flower, × 1½. *e*, Spiranthes romanzoffiana Cham., inflorescence, × 1; *f*, lip, × 4. *g*, S. porrifolia Lindl., lip, × 4. *h*, Corallorrhiza striata Lindl., flower, × 2.

Refs.—SPIRANTHES ROMANZOFFIANA Cham. & Schlect. Linnaea 3:32 (1828), type loc. Unalaska, *Chamisso*; Jepson, Fl. W. Mid. Cal. 133 (1901). *Gyrostachys gemmipara* Ktze. Rev. Gen. Pl. 2:664 (1891). *G. romanzoffiana* MacM. Met. Minn. 171 (1892). *Orchiastrum romanzoffianum* Greene, Man. Bay Reg. 306 (1894). *Ibidium romanzoffianum* House, Muhl. 1:129 (1906).

2. **S. porrifolia** Lindl. (Fig. 60g.) Flowers creamy or yellowish white. Marshy meadows or springy spots, cismontane Southern California, Coast Ranges, and Sierra Nevada. North to Washington.

Locs.—Bluff Lake, San Bernardino Mts., acc. *Parish* (Pl. World, 20:209); Santa Cruz Mts., acc. *Anderson* (Nat. Hist. Santa Cruz Co., 43); Howell Mt., *Tracy* 445; Ft. Bragg, *W. C. Mathews;* Dobbyn Creek, Humboldt Co., *Tracy* 4721; Mt. Shasta, acc. *Ames* (Orchid. 1:143); Sierra Valley, acc. *Ames* l.c.; Tallac, *Jepson* 8080; Amador Co., acc. *Ames* l.c.; Confidence, Tuolumne Co., *Jepson* 7702; Giant Forest, *Newlon.*

Refs.—SPIRANTHES PORRIFOLIA Lindl. Gen. & Sp. Orch. 467 (1840), type loc. northwest America. *Gyrostachys porrifolia* Ktze. Rev. Gen. Pl. 2:664 (1891). *Orchiastrum porrifolium* Greene, Man. Bay Reg. 306 (1894). *Ibidium porrifolium* Rydb. Bull. Torr. Club 32:610 (1905).

5. **PERAMIUM** Salisb. RATTLE-SNAKE PLANTAIN

Scape erect, bearing a few sheathing scale-like leaves, a terminal spike, and at base a cluster of petioled white-reticulated leaves. Rootstock creeping, with fleshy roots. Flowers white, similar to Spiranthes. Lateral sepals free, the upper one united with the petals into an erect galea. Lip sac-shaped, sessile, entire and without callous thickenings at base. Anther without a lid.—Species 25, North America, Europe, Asia. (Greek pera, a leathern pouch, referring to the lip.)

1. **P. decipiens** Piper. Plants 11 to 15 inches high, glandular-pubescent, especially the scapes and inflorescence; leaves thickish, rosulate, oblong-ovate, acute at both ends, reticulated with white or light-colored veins or markings, 1¼ to 2½ inches long, on petioles ½ to ¾ inch long; flowers 3 to 4 lines long; spike 3 to 5 inches long.

Coniferous woods, Sierra Nevada from Mariposa Co. north to Modoc Co., thence westerly to Humboldt Co. and south along the coast to Marin Co. North to British Columbia, east to Quebec. Also in Arizona.

Locs.—Pohono Bridge, Yosemite Valley, *Hall*; Calaveras Big Trees, *A. L. Grant* 570; North Fork American River, *P. B. Kennedy* 407; Brush Creek, Butte Co., *Kate Conger*; Forestdale, Modoc Co., *M. S. Baker*; Shasta Springs, *Jepson*; Mt. Eddy, *C. F. Baker* 3929; Hupa, *Chandler* 1397a; Bald Mt., Humboldt Co., *Tracy* 4624; Humboldt Bay, *Tracy* 4595.

Refs.—PERAMIUM DECIPIENS Piper, Contrib. U. S. Nat. Herb. 11:208 (1906). *Spiranthes decipiens* Hook. Fl. Bor. Am. 2:203, t. 204 (1839), type loc. Lake Huron. *Goodyera menziesii* Lindl.; Wats. Bot. Cal. 2:136 (1880); Jepson, Fl. W. Mid. Cal. 133 (1901). *Peramium menziesii* Morong. Mem. Torr. Club 5:124 (1894). *Epipactis decipiens* Ames, Orch. 2:261 (1908).

6. **EPIPACTIS** Haller

Stem leafy from a creeping rootstock. Flowers in a raceme with foliaceous bracts. Sepals and petals nearly equal, spreading; lip strongly constricted at the middle, the lower portion deeply concave, the upper portion dilated. Anther 2-celled, sessile behind the broad truncate stigma, on a slender jointed base; the pollen-masses become attached above to the gland capping the small rounded beak of the stigma. Ovaries reflexed at maturity.—Species 10, north temperate zone. (Greek epipegnuo, because used to curdle milk.)

1. **E. gigantea** Dougl. STREAM ORCHIS. Stout, 1 to 3 (or 4) feet high, nearly glabrous; leaves ovate below, lanceolate above, acute or acuminate, 3 to 7 inches long; raceme minutely pubescent; flowers 3 to 10, on pedicels 2 lines long; sepals greenish, 7 lines long (exceeding the petals), the upper concave and somewhat carinate; petals rose-color, purple-veined, particularly the lip; lower portion of lip with short erect lobes or wings and with many callous tubercles near the base, the upper portion ovate-lanceolate, crested or ridged toward the base.

Moist stream banks: mountains throughout California. North to Washington and east to Colorado and Texas. May.

Locs.—Southern California: Noble Mine, San Diego Co., *Chandler* 5477; Strawberry Valley, San Jacinto Mts., *Hall* 2370; Little Morongo Creek, acc. Parish; San Antonio Cañon, *Peirson* 13; Los Angeles, *G. S. Towne*; Mt. Pinos, *Hall* 6677. Coast Ranges: Lucia, Santa Lucia Mts., *Jepson* 1673; Mt. Diablo, *C. F. Saunders*; Sonoma Co., *Bioletti*; Grouse Creek, Humboldt Co., *Chesnut & Drew*; Siskiyou Co., *C. B. Bradley*. Sierra Nevada: South Fork Kaweah River, *Culbertson* 4286; Eagle Peak, Mariposa Co., *Chesnut & Drew*; Yosemite Valley, *Jepson*; Hetch-Hetchy, *Drew*; Douglas Flat, Tuolumne Co., *A. L. Grant* 902; Clover Creek, Plumas Co., *Jepson* 8025. Desert ranges: Panamint Mts., *Jepson* 7098; White Mts., *Jepson* 7214.

Refs.—EPIPACTIS GIGANTEA Dougl.; Hook. Fl. Bor. Am. 2:202, t. 202 (1839), type locs. Blue and Rocky mountains, *Douglas*; Jepson, Fl. W. Mid. Cal. 132 (1901). *Helleborine gigantea* Druce, Bull. Torr. Bot. Club 36:547 (1909). *Serapias gigantea* A. A. Eaton, Proc. Biol. Soc. Wash. 21:67 (1908).

7. **LISTERA** R. Br. TWAYBLADE

Stem low, bearing a pair of broad sessile opposite leaves at the middle, and arising from a cluster of fibrous creeping roots. Flowers small and greenish, in a loose raceme. Perianth spreading or reflexed; sepals and petals similar; lip free, longer than the sepals, flat and dilated, more or less deeply bifid. Column free, bearing the ovate anther naked (without lid) at the back of the summit. Pollen-masses 2, powdery, united to a very minute gland upon the rounded entire beak of the stigma. Capsule ovoid.—Species 12, frigid and north temperate zones. (Martin Lister, 1638–1711, a celebrated English naturalist.)

Leaves orbicular or ovate; raceme pubescent.
Lip 4 to 5 lines long, distinctly obtuse-lobed at apex, clawed at base....1. *L. convallarioides.*
Lip 1½ to 2 lines long, apex rounded with a shallow notch bearing an inconspicuous tooth, base sessile with a short subulate tooth on each side....2. *L. caurina.*
Leaves deltoid-cordate; raceme glabrous; lip sharply cleft to the middle into 2 attenuate lobes....3. *L. cordata.*

1. **L. convallarioides** Torr. Stem slender, ¼ to 1 foot high, pubescent above the leaves; leaves orbicular to broadly ovate, often abruptly acute or obtuse at apex, 1 to 3 inches broad; flowers 6 to 12, greenish, on short pedicels; sepals and petals linear to linear-lanceolate, about 2 lines long; lip narrowly cuneate-obovate, 4 to 5 lines long, distinctly 2-lobed at the dilated apex, toothed on each side at base just above the short but slender claw, the basal papillae very minute or none; capsule 4 lines long.

Moist shaded places in the mountains, 3500 to 6000 feet: North Coast Ranges from Mendocino Co. to Siskiyou Co.; Sierra Nevada from Tuolumne Co. to Shasta Co.; San Jacinto Mts. North to Alaska, east to Newfoundland.

Locs.—Mt. Sanhedrin, *Hall* 9487; Smith Creek, Trinity Co., *Yates* 548; Coffee Creek, Salmon Mts., *Hall* 8533; Sisson, *Jepson*; Colby, Butte Co., *R. M. Austin* 839; Lassen Creek, *R. M. Austin* 215; Sierra Co., *Lemmon* 256; Truckee River, *Sonne*; Lake Tahoe, *Blasdale*; Carson Pass to Calaveras Big Trees, *Brewer* 2096; Brightman's Flat, Tuolumne Co., *A. L. Grant*; Snow Creek, Fresno Co., *A. L. Grant*; Giant Forest, *Newlon*; Snow Creek, Mt. San Jacinto, *Hall* 2534.

Refs.—LISTERA CONVALLARIOIDES Torr. Fl. N. U. S. 320 (1826). *Epipactis convallarioides* Swartz. Vet. Acad. Handl. Stock. 21:232 (1800), type loc. "E. terra Nova Amer. sept." *Ophrys convallarioides* Wight, Bull. Torr. Club 32:380 (1905).

2. **L. caurina** Piper. Stem very slender, 4 to 6 inches high, pubescent above the leaves; leaves ovate, acute or obtuse, sessile by a clasping base, 1 to 1½ inches long; bracts ovate, acute, ⅓ the length of the pedicels; flowers 5 to 15, greenish, very small, on pedicels 2 to 3 lines long; sepals and petals lanceolate to linear-lanceolate, 1 to 1½ lines long, spreading; lip 1½ to 2 lines long, cuneate, with an inconspicuous tooth in the shallow notch at the rounded apex and a short subulate tooth on each side at the base, a papilla at the base of each tooth; column short, not stout; capsule 3 lines long.

Damp woods, high mountains: Humboldt Co. Oregon to Idaho and Alaska.

Loc.—Hupa Mt., *Davy* 5648.

Refs.—Listera caurina Piper, Erythea 6:32 (1898), type loc. Henderson, Lane Co., Ore., *Piper*. *Ophrys caurina* Rydb. Bull. Torr. Club 32:610 (1905).

3. **L. cordata** R. Br. Stem slender, 2 to 8 inches high; leaves deltoid-cordate, ½ to 1¼ inches broad, mucronate; raceme glabrous; flowers 6 to 24, purplish or yellowish; sepals ovate, about 1 line long; petals broadly oblong; lip narrow, twice the length of the petals, cleft to the middle into two attenuate lobes, and bearing an orbicular ridge at its base and a subulate basal tooth on each side; column very short; capsule 2 lines long.

Humboldt Co. North to Alaska and across the continent. Also in Europe and Asia.

Loc.—Buck Mt., near Van Duzen River, *Tracy* 2723.

Refs.—Listera cordata R. Br.; Ait. Hort. Kew. ed. 2, 5:201 (1813). *Ophrys cordata* L. Sp. Pl. 2:946 (1753), type European.

8. **CEPHALANTHERA** Rich.

Stem from a creeping rootstock, bearing medium-sized flowers in a bracted spike. Leaves in ours reduced to scarious sheaths. Sepals and petals nearly equal, connivent, the latter somewhat united and galeate, not gibbous at base. Lip free, concave, contracted and somewhat jointed in the middle. Column slender, elongated. Anther shortly stipitate, so as to be nearly or quite above the level of the top of the stigma. Pollen-masses not connected nor attached to a gland. Stigma wholly beakless.—Species 10, north temperate zone; northern Africa. (Greek cephale, head, and anthera, anther.)

1. **C. austinae** Heller. Phantom Orchis. Symbiotic saprophyte, the whole plant white, 10 to 20 inches high; rootstock upright with mycorhizal rootlets; leaves 3 to 6, 1 to 2 inches long; flowers many to numerous; sepals and petals similar, oblong-lanceolate, ½ to ¾ inch long; lip shorter, its middle lobe hinged, 3 to 5-nerved within, and with upturned sides, the lateral lobes (with the column) forming a saccate base; column 2 lines long, about twice longer than the anther.

Dense mountain forests, Coast Ranges and Sierra Nevada northward. Oregon. Very rare.

Locs.—Santa Lucia Mts., *Jepson*; Mt. Sanhedrin, *Hall* 9489; Trinity Summit, *Jepson* 2027; Salmon Summit, w. Siskiyou Co., *Jepson* 2090; Mt. Shasta, *Hall & Babcock* 4079; Strawberry, Tuolumne Co., *Jepson* 6467; Yankee Hill, Columbia, *A. L. Grant* 1224; Little Yosemite Valley, *Hall* 9045; Snow Creek, Fresno Co., *A. L. Grant*.

Refs.—Cephalanthera austinae Heller, Cat. N. Am. Pl. ed. 2, 4 (1900). *Chlorea austinae* Gray, Proc. Am. Acad. 12:83 (1876), type loc., Quincy, Plumas Co., *R. M. Austin*. *Serapias austinae* A. A. Eaton, Proc. Biol. Soc. Wash. 21:66 (1908). *Cephalanthera oregana* Reich. f., Linnaea 41:53 (1877), type loc. Willamette Valley, Ore., *Nuttall*; MacDougal, Bull. Torr. Club 26:513–518, pl. 367 (1899).

9. **CORALLORRHIZA** R. Br. Coral-root

Brownish or yellowish saprophytes or root-parasites, destitute of green herbage, and with branching toothed coral-like roots. Stems scape-like, the leaves reduced to scales, and bearing the flowers in a terminal raceme. Perianth-segments oblong or lanceolate, nearly alike, ours 3-nerved, gibbous at base over the ovary, or the lateral sepals united at base with the foot of the column, forming a short spur which is adnate to the summit of the ovary. Lip 1 to 3-ridged. Column 2-edged, slightly incurved. Anther terminal, opening by a lid. Pollen masses 4, soft-waxy. Capsules reflexed.—Species 12, north temperate zone. (Greek korallion, coral, and rhiza, root.)

Perianth 3 to 4 lines long, the lateral sepals with a spur at base.

Spur wholly attached to the ovary; lip broad, 3-lobed, spotted.....1. *C. maculata*.

Spur free for its apical half; lip oblong, entire, or toothed at base, dark red.....2. *C. mertensiana*.

Perianth 6 to 8 lines long, gibbous at base; spur none; lip entire, purple-veined....3. *C. striata*.

1. **C. maculata** Raf. Stems 8 to 13 inches high; raceme 2 to 7 inches long; sepals and petals brownish-purple, 3-nerved, 3 to 4 lines long; lateral sepals united at base with the foot of the column forming a short (1 line long) spur which is adnate to the ovary; lip white, conspicuously spotted with purple, broadly ovate and somewhat convex, 3-lobed by a deep cleft on each side; middle lobe rounded, the edge turned up a little on the sides and denticulate at apex; capsule ¾ inch long.

Mountain woods, mostly 3000 to 6000 feet: cismontane Southern California, north through the Coast Ranges and Sierra Nevada to Siskiyou Co. North to British Columbia; east to the Atlantic.

Locs.—Southern California: Palomar, San Diego Co., *McClatchie*; Tauquitz Valley, *Hall* 2345; Little Green Valley, San Bernardino Mts., *G. R. Hall* 15. Coast Ranges: Burlingame, *M. S. Baker*; Mt. St. Helena, *Jepson*; Castle Peak, ne. Mendocino Co., *Jepson*; Buck Mt., Humboldt Co., *Tracy* 4191; Buckeye Mt., Trinity Co., *Yates* 460; Green Pt. Ranch, Hupa Road, *Jepson* 1947; Sisson, *Jepson*. Sierra Nevada: Round Mdw., Giant Forest, *Jepson* 662; Huntington Lake, *A. L. Grant* 1415a; Wawona, *Jepson* 4306; Cedar Creek, upper Stanislaus River, *Jepson* 6527; Calaveras Big Trees, *A. L. Grant* 575; Bear Valley, Nevada Co., *Jepson*; Sierraville, *Alma Ames* 13; Big Mts., Modoc Co., *M. S. Baker*.

Refs.—CORALLORRHIZA MACULATA Raf. Am. M. Mag. 2:119 (1817); Greene, Leafl. 1:237 (1906). *Cladorhiza maculata* Raf. l.c. 1:429 (1817), type loc. Philadelphia. *Corallorrhiza multiflora* Nutt. Jour. Acad. Phila. 3:138, pl. 7 (1823), type from eastern U. S.; Jepson, Fl. W. Mid. Cal. 134 (1901); Gruenberg, Bull. Torr. Club 36:167 (1909).

2. **C. mertensiana** Bong. Stems 6 to 20 inches high; raceme more open than in C. maculata, its axis lurid-purple; flowers reddish tinged or veined with purple; sepals and petals linear-lanceolate, 3 or 4 lines long; upper sepal erect, covering closely the two petals; lower sepals deflexed-spreading; spur 1 line long, the lower half free from the ovary; lip dark red, oblong, obtuse, entire or with a tooth on one or both sides near the base, clawed below, thin and concave, the ridges only slightly prominent; capsule 5 to 8 lines long, attenuate into the short slender pedicel.

Woods, Humboldt and Siskiyou cos. North to Alaska.

Locs.—Bald Mt., Humboldt Co., *Davy & Blasdale* 5621; Redwood Creek, Humboldt Co., *Jepson* 1984; Trinity Summit, *Manning* 15½; Mt. Eddy, Siskiyou Co., *E. B. Copeland* 3926.

Refs.—CORALLORRHIZA MERTENSIANA Bong. Mem. Acad. St. Petersb. ser. 6, 2:165 (1832), type loc. Sitka, *Mertens*.

3. **C. striata** Lindl. (Fig. 60h.) Stems many in a cluster, 8 to 20 inches high, with 3 or 4 sheathing leaves; raceme 2 to 8 inches long; sepals and petals somewhat flesh-colored, striately 3-nerved with purple or reddish brown lines, about 6 lines long, approximated on upper side of flower and curved over column in such a way as to form a sort of hood; lateral sepals oblique; lip quite entire, its edge a little upturned; spur none but the base of the perianth prominently gibbous over the ovary; capsule 6 to 9 lines long.

Woods along the coast from Santa Cruz Co. to Humboldt Co.; Sierra Nevada and northerly to Modoc and Siskiyou cos. North to British Columbia and east to Ontario.

Locs.—Burlingame, *Inez Smith*; Camp Taylor, Marin Co., *Sonne*; Mt. Tamalpais, *Davy*; Cahto, Mendocino Co., *Davy* 6612; Buck Mt., Humboldt Co., *Tracy* 4131; Trinity Summit trail, *Davy* 5818; Humbug Mt., Siskiyou Co., *Butler* 1292; Modoc Co., *M. S. Baker*; Prattville, Plumas Co., *E. M. Austin*; Blue Cañon, Placer Co., *H. A. Walker* 1221; Calaveras Big Trees, *A. L. Grant*; Strawberry, Tuolumne Co., *Jepson* 6499; Eight-mile, Wawona, *Jepson* 4289; Pine Ridge, Fresno Co., *Hall & Chandler* 108. Not yet reported from Tulare Co.

Refs.—CORALLORRHIZA STRIATA Lindl. Gen. & Sp. Orch. 534 (1840), type from northwest America, *Douglas*; Torr. Pac. R. Rep. 4, pl. 25 (1857). *C. bigelovii* Wats. Proc. Am. Acad. 12:275 (1877), based on material from the "Sierra Nevada and mountains of n. California."; Jepson, Fl. W. Mid. Cal. 134 (1901).